

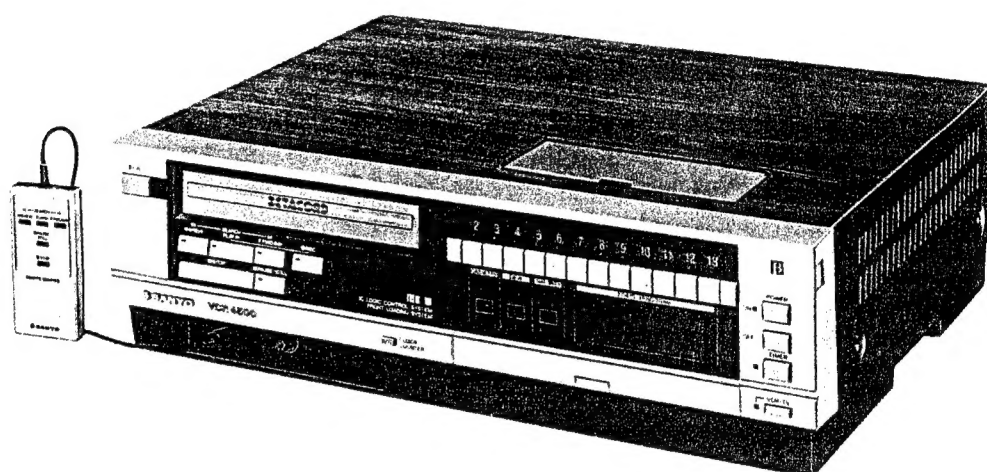
SERVICE MANUAL

COLOR VIDEO CASSETTE RECORDER



SANYO

VCR 4500




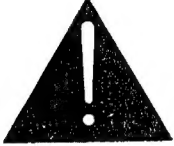


SPECIFICATION

Video recording system	Rotary 2-head helical scan: β II/ β III switchable
TV system	NTSC
Mechanism	5-motor quartz-locked drive
Search	9x, forward and reverse
Tuner input	VHF: 2 - 13, UHF: 14 - 83
Video S/N ratio	45dB
Audio S/N ratio	42dB
Power	120V AC, 60Hz, 37 watts
Dimensions	17-5/16W x 5-3/16H x 13-25/32D
Weight	19 lbs.

FEATURES

- * Front cassette loading mechanism
- * Beta II/III recording and playback
- * Feather touch transport control
- * 4-digit electronic tape counter with memory stop
- * Maximum recording time 5 hours with L-830 cassette tape
- * Built-in 7 day, 1-event timer
- * Forward and reverse picture search
- * Still image playback
- * Simple editing
- * 8-mode remote control unit

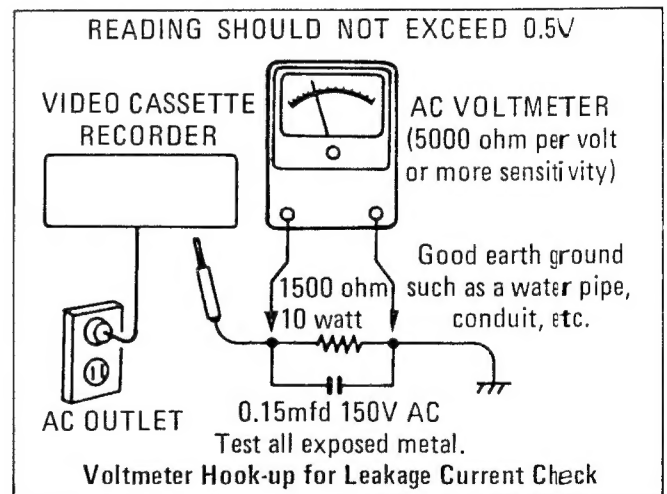
	CAUTION RISK OF ELECTRIC SHOCK DO NOT OPEN	
CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.		
	THIS SYMBOL INDICATES THAT DANGEROUS VOLTAGE CONSTITUTING A RISK OF ELECTRIC SHOCK IS PRESENT WITHIN THIS UNIT.	
	THIS SYMBOL INDICATES THAT THERE ARE IMPORTANT OPERATING AND MAINTENANCE INSTRUCTION IN THE LITERATURE ACCOMPANYING THIS UNIT.	

SAFETY PRECAUTIONS

LEAKAGE CURRENT CHECK

Plug the AC line cord directly into a 120V AC outlet (do not use an isolation transformer for this check). Use an AC voltmeter, having 5000 ohms per volt or more sensitivity. Connect a 1500 ohm 10 watt resistor, paralleled by a 0.15 mfd 150V AC capacitor between a known good earth ground (waterpipe, conduit, etc.) and all exposed metal parts of the cabinet (antennas, handle bracket, metal cabinet, screwheads, metal overlays, control shafts, etc.). Measure the AC voltage across the 1500 ohm resistor. The test must be conducted with the AC switch on and then repeated with the AC switch off. The AC voltage indicated by the meter may not exceed 0.5 volts. A reading exceeding 0.5 volts indicates that a dangerous potential exists, the fault must first be located and corrected.

Repeat the above test with the VCR power plug reversed. NEVER RETURN A VCR TO THE CUSTOMER WITHOUT TAKING NECESSARY CORRECTIVE ACTION.



PRODUCT SAFETY NOTICE

Product safety should be considered when a component replacement is made in any area of a VCR. Components indicated by the symbol \triangle in the parts list and the schematic diagram designate components in which safety can be of special significance. It is particularly recommended that only parts designated on the parts list in this manual be used for component replacement designated by the symbol. No deviations from resistance, wattage or voltage ratings may be made for replacement items designated by the symbol.

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1. CABINET DISASSEMBLY

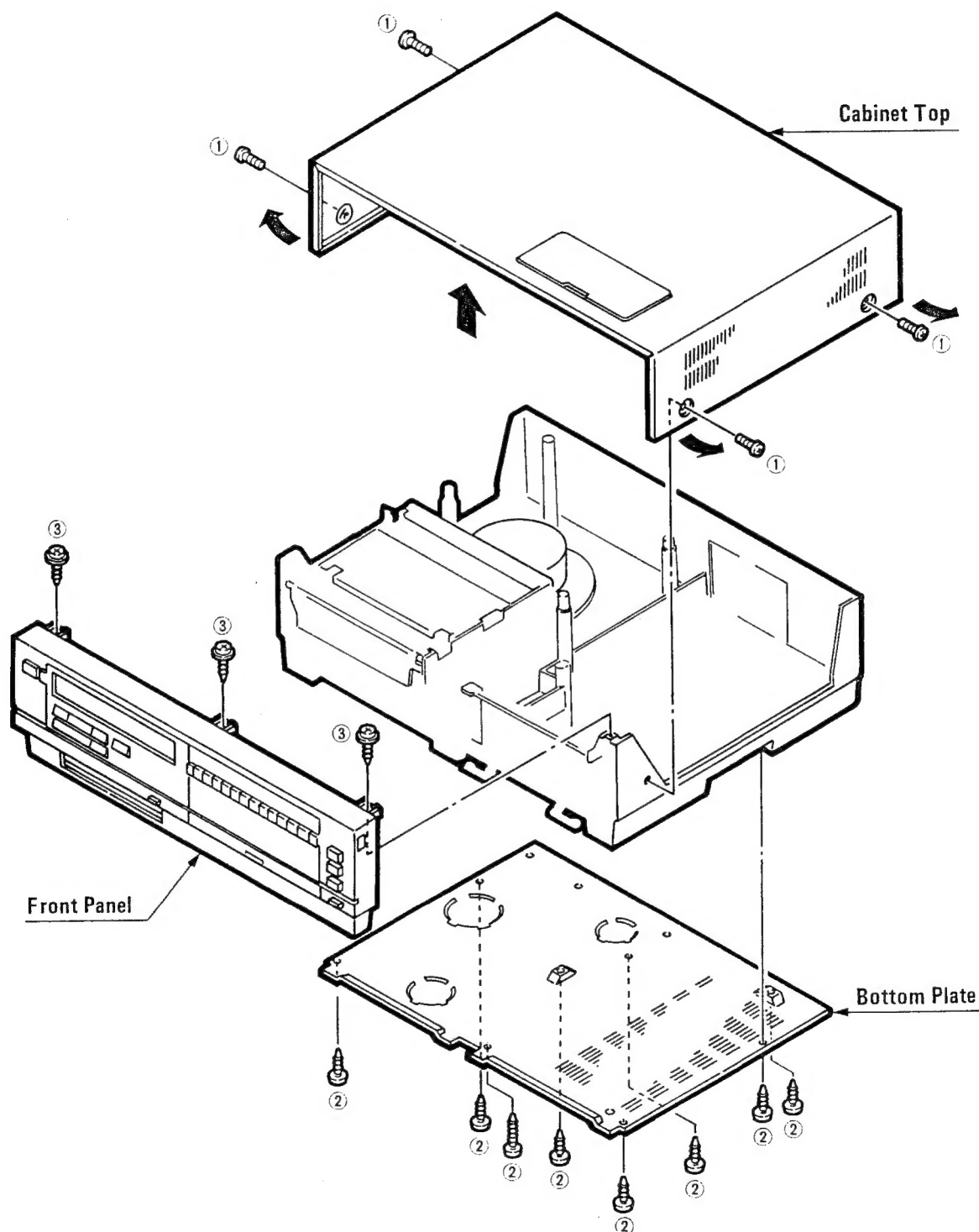


Fig. 1-1

2. CIRCUIT BOARD DISASSEMBLY

1. CIRCUIT BOARD LOCATIONS

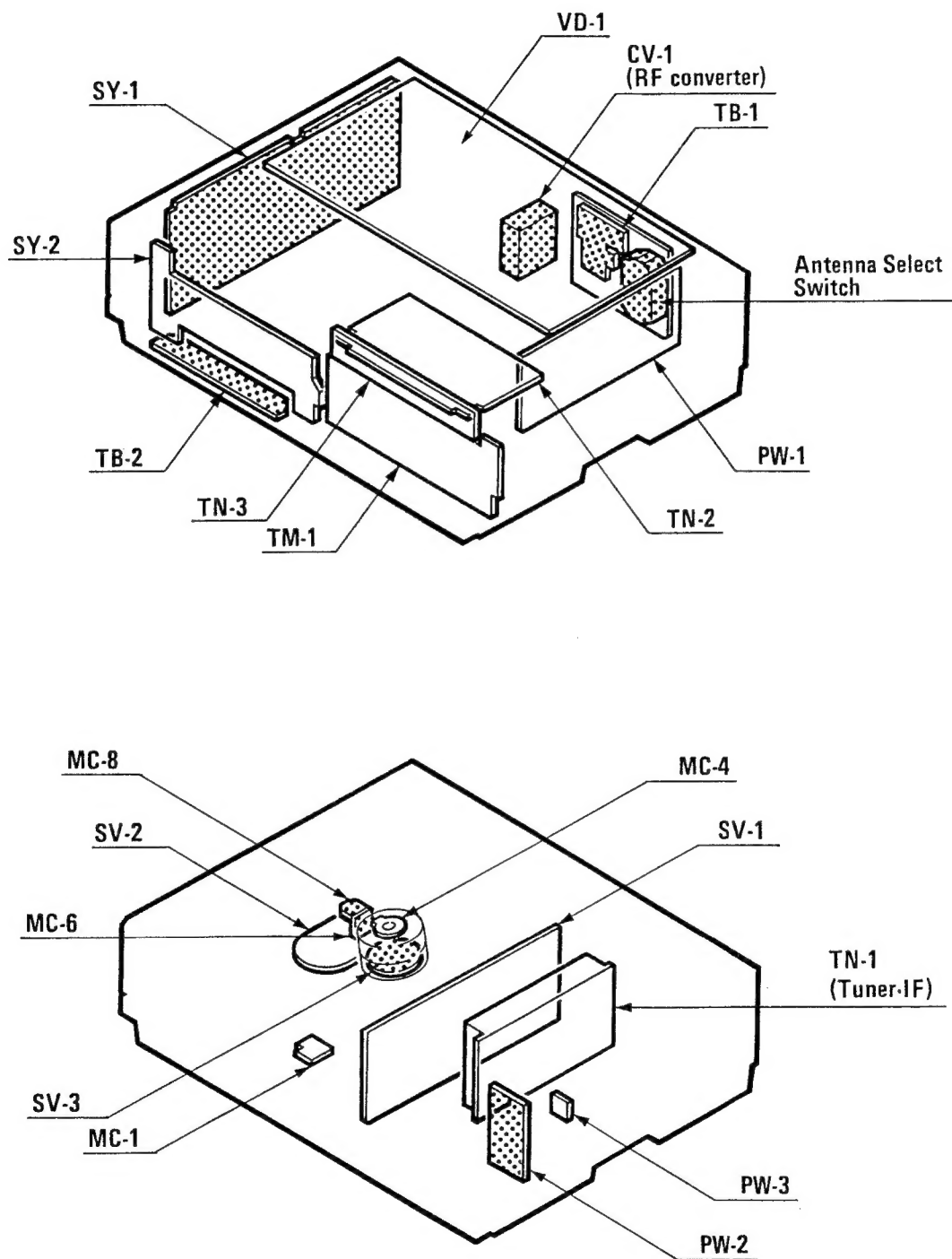
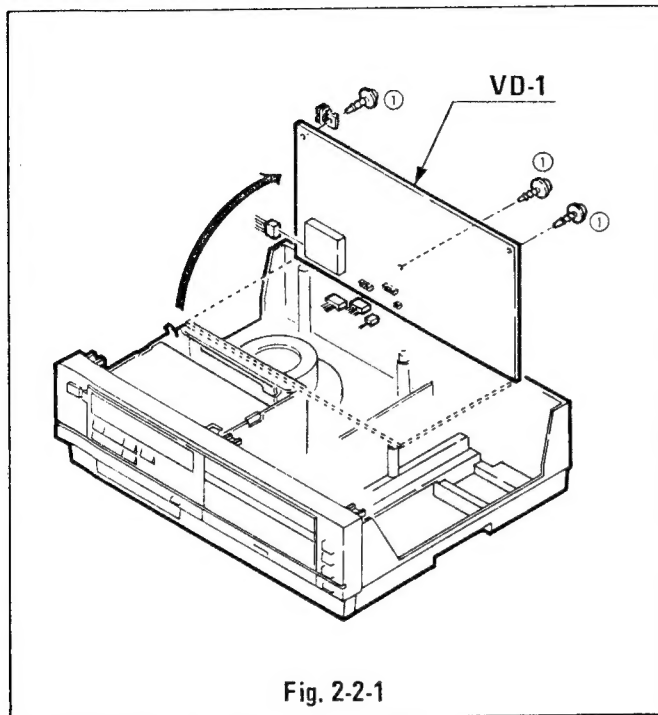


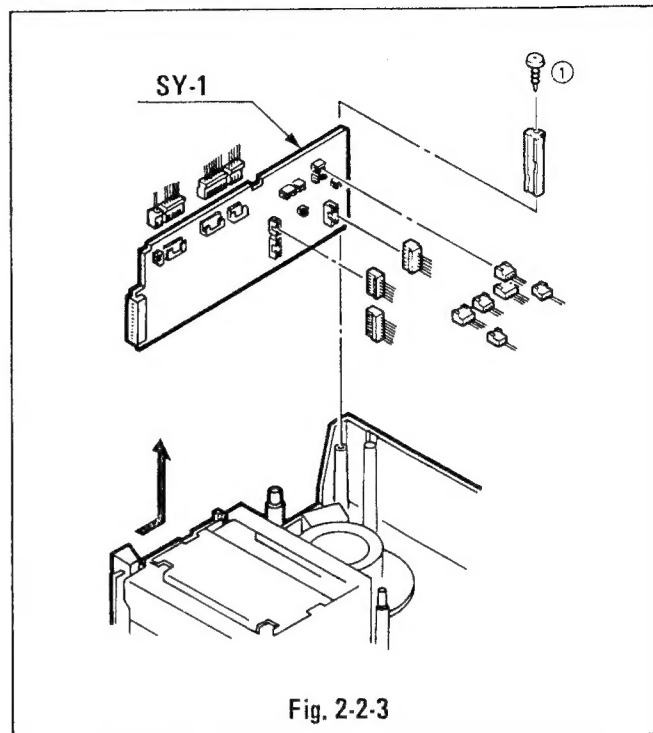
Fig. 2-1-1

2. REMOVAL OF THE MAIN CIRCUIT BOARD

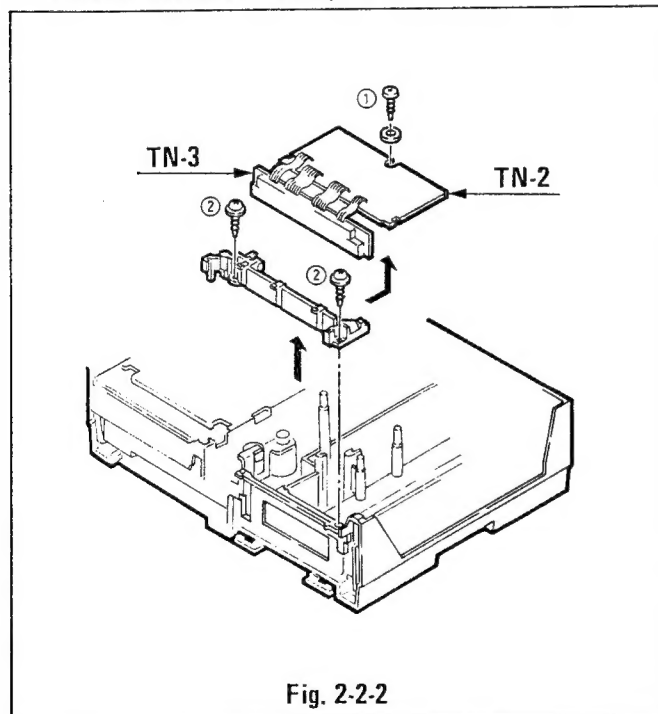
1. VIDEO CIRCUIT (VD-1)



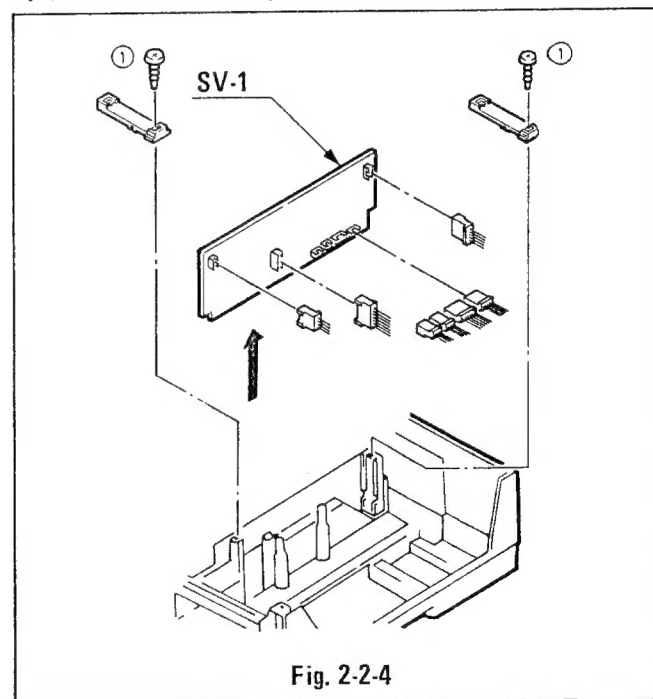
3. SYSTEM CONTROL CIRCUIT (SY-1)



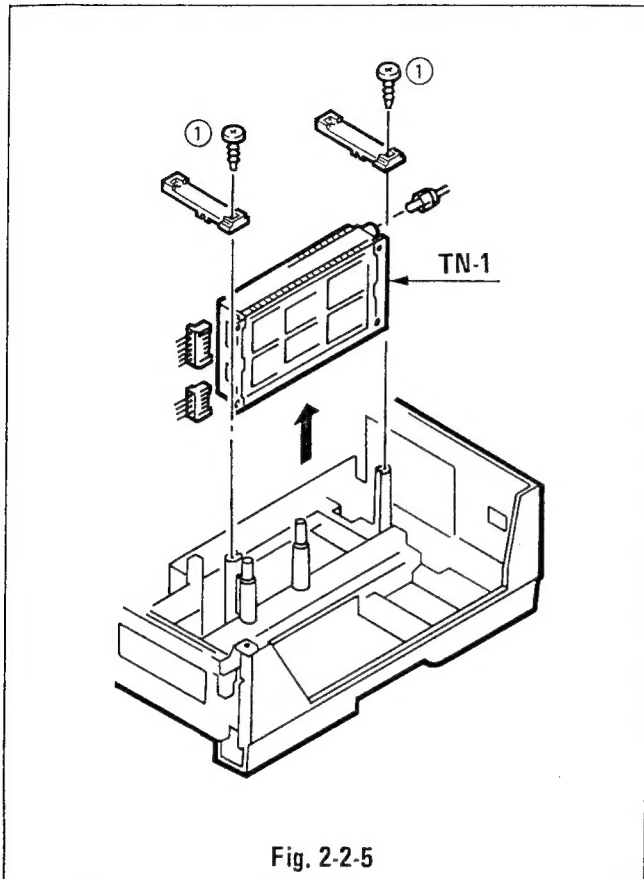
2. TUNER CIRCUIT (TN-2, TN-3)



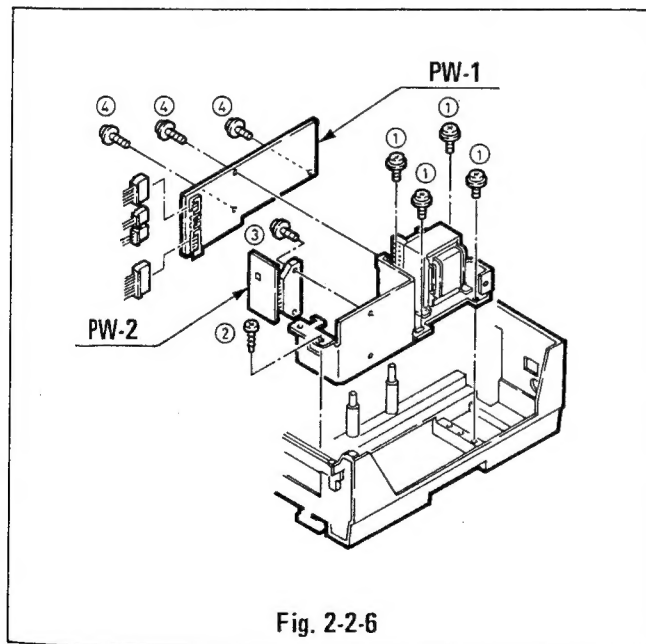
4. SERVO CIRCUIT (SV-1)



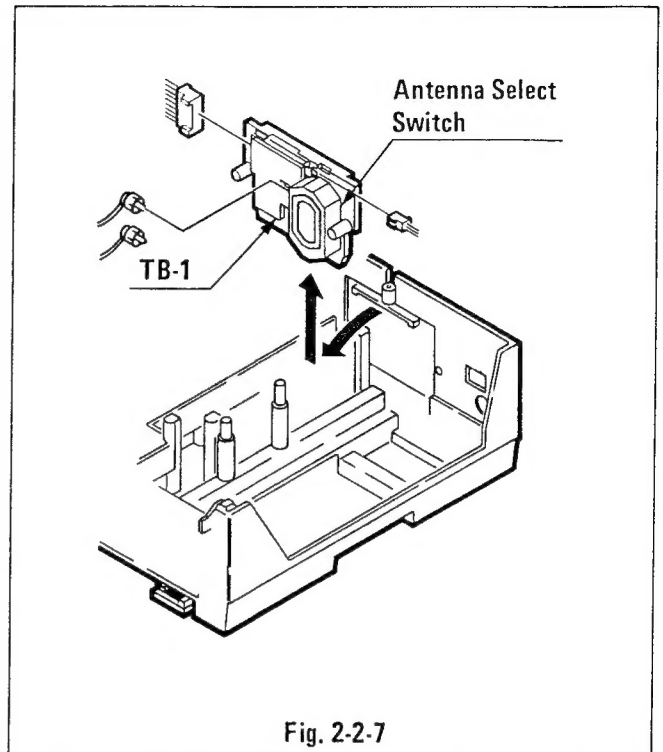
5. TUNER AND IF CIRCUIT (TN-1)



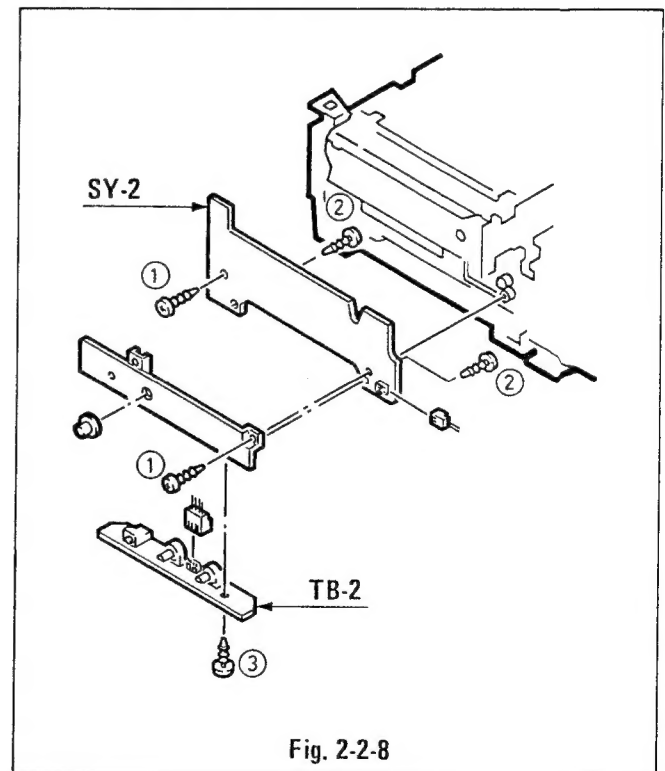
6. POWER SUPPLY CIRCUIT (PW-1, PW-2)



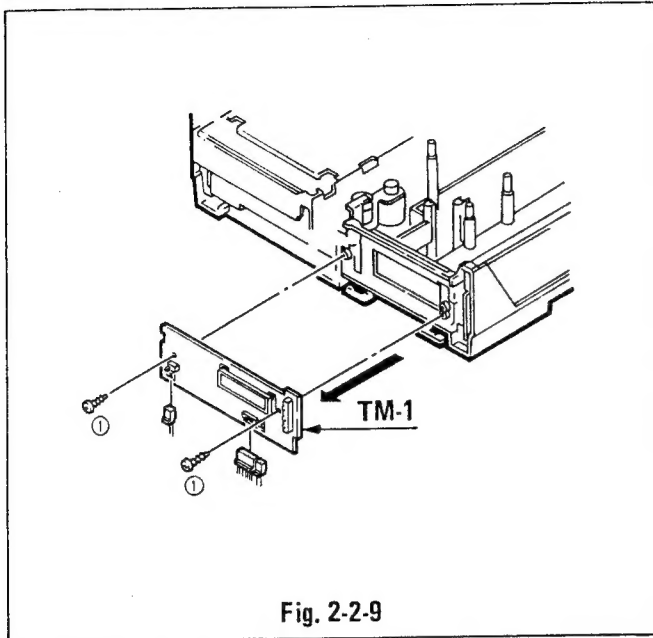
7. ANTENNA TERMINAL BOARD (TB-1)



8. SYSTEM CONTROL CIRCUIT AND TERMINAL BOARD (SY-2, TB-2)



9. TIMER CIRCUIT (TM-1)



3. CIRCUIT ADJUSTMENT

1. PREPARATIONS FOR ADJUSTMENT

1. EQUIPMENT

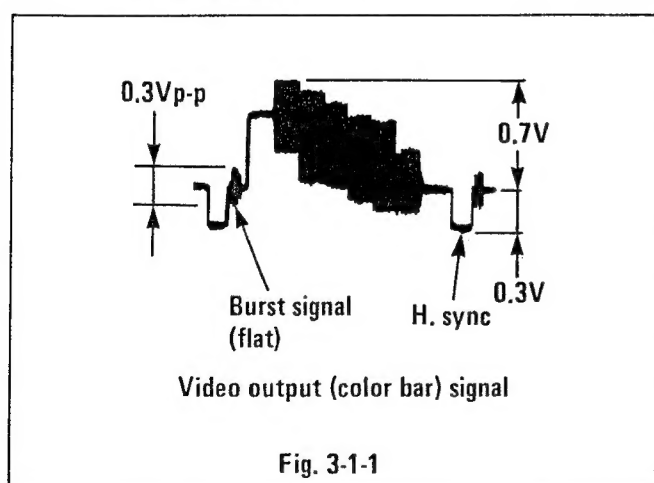
- (1) Color TV monitor
- (2) Color bar generator (with RF)
- (3) Audio frequency oscillator
- (4) Attenuator
- (5) Oscilloscope (double latent image; with delay function; frequency response: 10MHz or more; probe: 10:1)
- (6) Frequency counter (countable to 10MHz or higher)
- (7) Digital voltmeter
- (8) VTVM (vacuum tube voltmeter)
- (9) In/output probes

2. SET-UP

Because the RF input signal is used for adjustment of circuits, connect the color bar generator to the VHF input terminal of the VCR. The RF input signal is processed by the tuner and IF circuit. It is important that the video output signal of the IF circuit satisfy the items shown in figure.

Connect the oscilloscope to the LINE OUT terminal of the video circuit, and then check the video output signal.

- The amplitude of the sync signal should be approximately 0.3Vp-p.
- The amplitude of the video signal should be approximately 0.7Vp-p.
- While observing the oscilloscope or TV screen, make fine-tuning adjustments so that the color burst amplitude is approximately 0.3Vp-p.
- Check to be sure that there is no spike noise in the sync part of the horizontal sync signal.



3. ALIGNMENT TAPE

(1) Alignment tape for service use
VJ-0093 (KR5-1Z)

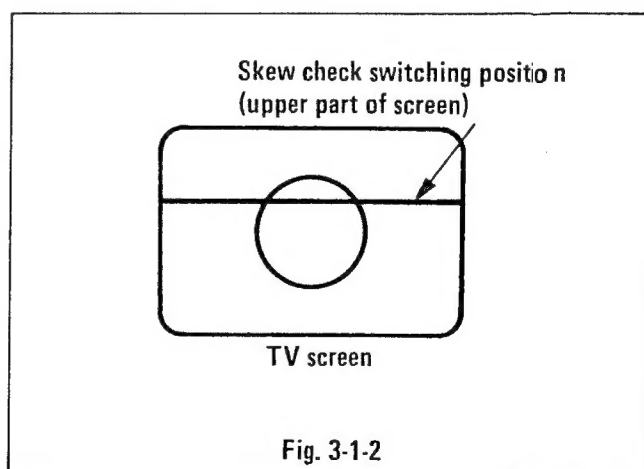
Tape speed	Video signal	Audio signal	Time
β II 20.0mm/sec	Color bar	3kHz -5dB	4 minutes
	Monoscope (skew)	333Hz -25dB	4 minutes
	RF sweep	5kHz -25dB	4 minutes
	1MHz (A channel)	1kHz -5dB	4 minutes
β III 13.3mm/sec	Color bar	3kHz -5dB	4 minutes
	Monoscope	7kHz -25dB	4 minutes
	RF sweep	333Hz -5dB	4 minutes

Table 3-1-1

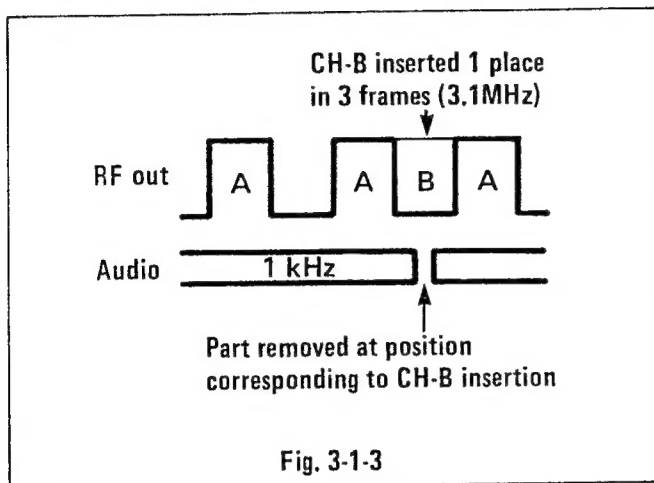
[Specifications]

(1) Video signal system

- V-locked sweep
 - Record frequency Max. frequency 8.5 ± 0.5 MHz
- Marker frequency and deviation 1, 2, 3.58, 4.5, 5.1MHz $\pm 2\%$
- Marker modulation during recording 100%
- Monoscope
 - Switching position 2H mode (skew)

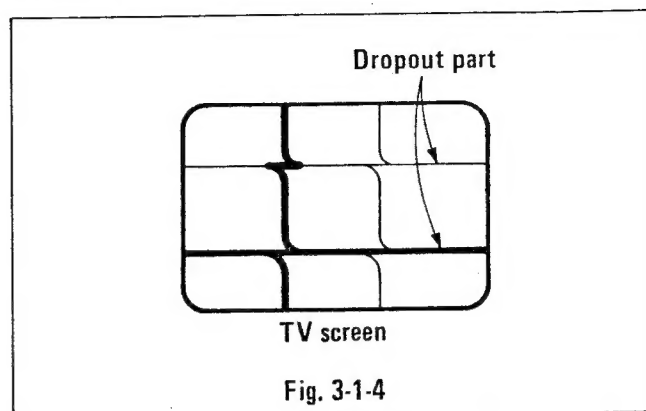


- Color bar 75%
- 1MHz CH-A tracking and CTL position
 - Recording signal frequency and deviation $1.0 \pm 0.1\text{MHz}$
 - Recording track CH-A ($\pm 7^\circ$)
 - CTL position check



- Linearity bending width $\pm 6\mu\text{m-p-p}$ or less
- CTL position $\pm 3\mu\text{m-p-p}$ or less
- (2) Audio signal system
 - For level adjustment
 - Recording signal frequency and deviation $333\text{Hz} \pm 3\%$
 - Recording level 2H mode Reference level $-20 \pm 0.5\text{dB}$
 - Recording level 3H mode Reference level $\pm 0.5\text{dB}$
 - For frequency response adjustment
 - Recording signal frequency and deviation $5\text{kHz} \pm 3\%$
 - Recording level Reference level $-20 \pm 0.5\text{dB}$
 - For speed deviation measurement
 - Recording signal frequency and deviation $3\text{kHz} \pm 0.15\text{Hz}$
 - Recording level Reference level $\pm 3\text{dB}$
 - For audio head height adjustment
 - Recording signal frequency and deviation $1\text{kHz} \pm 3\%$
 - Recording level Reference level $\pm 0.5\text{dB}$
- (3) Servo signal system
 - CTL frequency 29.97Hz
 - Duty cycle 50%
 - Polarity Positive
- (4) Other
 - Tape speed βII $20.0\text{mm/sec} \pm 0.2\%$
 - βIII $13.333\text{mm/sec} \pm 0.2\%$
 - Speed deviation of the one winding 0.03%
 - Sampling time 10 seconds
 - Recording time 28 minutes (winding start, 25 count, no signal)

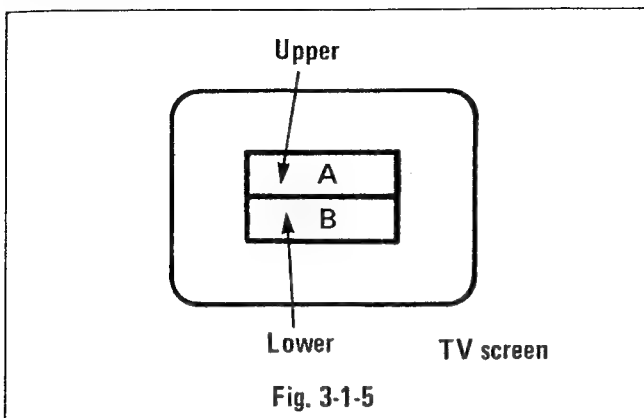
(2) Skew and dropout compensation alignment tape VJ-0030 (KR2-6L)



[Specifications]

- (1) Video signal system
 - Recording signal frequency and deviation V BAR
 - Deviation Normal deviation (100% b/w signal and sync tip frequency deviation)
- (2) Audio signal system
- (3) Servo signal system
 - CTL frequency 29.97Hz
 - Duty cycle 50%
 - Polarity Positive
- (4) Recording time 45 minutes (winding start, 100 count, no signal)
- (5) Skew $0.2\mu\text{sec}$ or less
- (6) Dropout compensation No-signal recording (without FM carrier)
- (7) Other
 - Linearity $8\mu\text{m}$
 - CTL position $\pm 5\mu\text{m}$ or less at track center

(3) Dropout compensation alignment tape
VJ-0069



[Specifications]

- (1) Video signal system
 - Recording signal Color bar
 - Luminance level (attenuation at 1H internals)
 - Upper -10dB (0.316)
 - Lower -24dB (0.0631)
- (2) Audio signal system No recording signal
- (3) Recording time
 - Until end (winding start, 20 count, no signal)

(4) Audio level (β II)

VJ-0126 (KR3-1D)

[Specifications]

- (1) Video signal system No recording signal
- (2) Audio signal system
 - Recording signal
 - frequency and deviation 333Hz \pm 3%
 - Recording level Reference level \pm 0.5dB or less
- (3) Servo signal system
 - CTL frequency 29.97Hz
 - Duty cycle 50%
 - Polarity Positive
- (4) Other
 - Tape speed β II 20.0mm/sec
 - Recording time
 - 40 minutes (winding start, 50 count, no signal)
 - Recording track pattern
 - 1.24 \pm 0.01mm from top edge of tape

4. SPECIFIED IN/OUTPUT LEVEL AND IMPEDANCE

[Video]

Input: video input, phono-type connector 1.0Vp-p, 75ohm unbalanced, negative sync

Output: video output, phono-type connector 1.0Vp-p, 75ohm unbalanced, negative sync

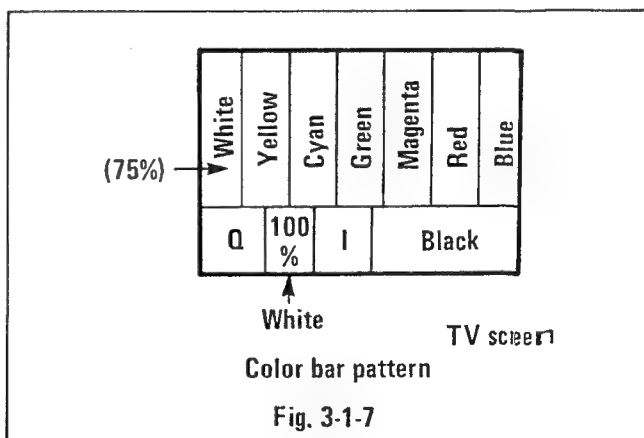
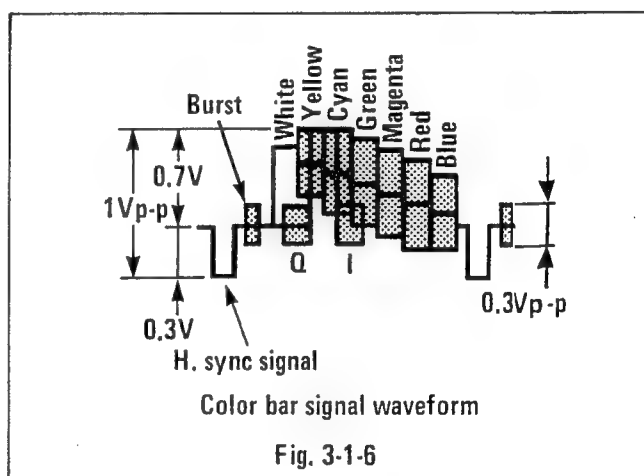
[Audio]

Input: audio input, pin jack, 100kohm, -10dB
MIC: standard jack, -60dB, for 600ohm impedance microphone

Output: audio output, pin jack, -5dB (100kohm load resistance), load impedance 10kohm or more

5. COLOR BAR SIGNAL

The 75% color bar signal recorded on the alignment tape is shown in Figure.



6. ADJUSTMENT STEPS

Adjust the circuits in the order shown below.

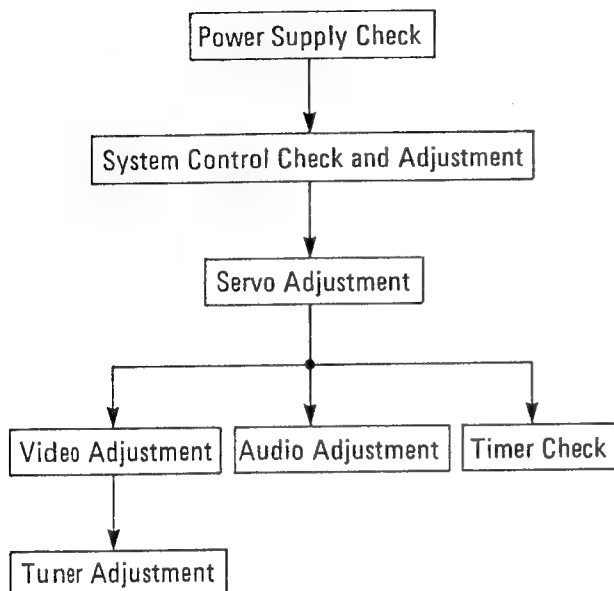


Table 3-1-2

2. POWER SUPPLY CIRCUIT CHECKS

1. AC POWER SUPPLY CHECK

(1) Check to be sure that the AC input voltage of the VCR is $120V \pm 10\%$.

2. REG +12V CHECK

(1) Connect a digital voltmeter to (3) and (9) of S5001.

Digital voltmeter + terminal: S5001 (3)

Digital voltmeter – terminal: S5001 (9)

(2) Check to be sure there is $DC +12 \pm 0.2V$.

3. REG +9V CHECK

(1) Connect a digital voltmeter to (6) and (9) of S5001.

Digital voltmeter + terminal: S5001 (6)

Digital voltmeter – terminal: S5001 (9)

(2) Check to be sure there is $DC +9 \pm 0.1V$.

4. TIMER +10V CHECK

(1) Connect a digital voltmeter to (7) and (8) of S5051.

Digital voltmeter + terminal: S5051 (7)

Digital voltmeter – terminal: S5051 (8)

(2) Check to be sure there is $DC +10 \pm 1V$.

5. TIMER –20V CHECK

(1) Connect a digital voltmeter to (3) and (8) of S5051.

Digital voltmeter + terminal: S5051 (3)

Digital voltmeter – terminal: S5051 (8)

(2) Check to be sure there is $DC -20 \pm 3V$.

6. CAPSTAN +12V CHECK (EXCEPT SPECIAL PLAYBACK)

(1) Connect a digital voltmeter to (4) and (3) of S5011.

Digital voltmeter + terminal: S5011 (4)

Digital voltmeter – terminal: S5011 (3)

(2) Check to be sure there is $DC +12 \pm 0.5V$.

3. SYSTEM CONTROL CIRCUIT CHECKS AND ADJUSTMENTS

1. POWER SUPPLY VOLTAGE CHECK

- (1) Check to be sure that DC +9V is supplied to (4) of S3001 on SY-1 board.
- (2) Check to be sure that DC +12V is supplied to (3) of S3001 on SY-1 board.
- (3) Check to be sure that DC +5V is supplied to pin (41) of IC3001 on SY-1 board.

2. COUNTER MEMORY CHECK

- (1) Set counter memory button to ON.
- (2) Check to be sure that the memory indication (M) is illuminated.
- (3) Set the unit to the REW mode.
- (4) Check to be sure that the tape automatically stops when the tape counter reading reaches 0000.
- (5) Check to be sure that unit switches to REW mode and tape is rewound when the REW button is pressed once again.

3. TAPE LOOSENESS CHECK

- (1) During tape playback, loosen the tape intentionally.
- (2) Check to be sure that the VCR automatically stops.

4. AUTOMATIC-STOP CHECK

- (1) Check to be sure that the unit switches to the mode described below when the metal-tape part (end of tape) is reached:

- Detection during standard forward ... STOP mode (after unloading)
- Detection during rewind STOP mode (after unloading)

5. FRONT LOADING AND LOADING OPERATION CHECK

- (1) Correctly insert a cassette.
- (2) Check to be sure that the front loading, and conventional loading, operation functions correctly.

6. FRONT UNLOADING AND UNLOADING OPERATION CHECK

- (1) Press the cassette ejection button.
- (2) Check to be sure that the front unloading operation functions correctly.

7. PLAY MODE CHECK

- (1) Press the PLAY button and check the following points:
 - The loading ring rotates and the unit goes into the loading mode.
 - The capstan motor begins to turn.
 - The head motor begins to turn.
 - The reel motor begins to turn.

8. REMOTE-CONTROL REFERENCE VOLTAGE ADJUSTMENT

- (1) Press the power switch to ON (unit is in STOP mode).
- (2) Connect a digital voltmeter to TP3203 (+9V line) and TP3201 (reference voltage) of SY-2 board.
- (3) Adjust VR3201 so that the potential difference is $1.40 \pm 0.02V$ for the reference voltage and +9V line.

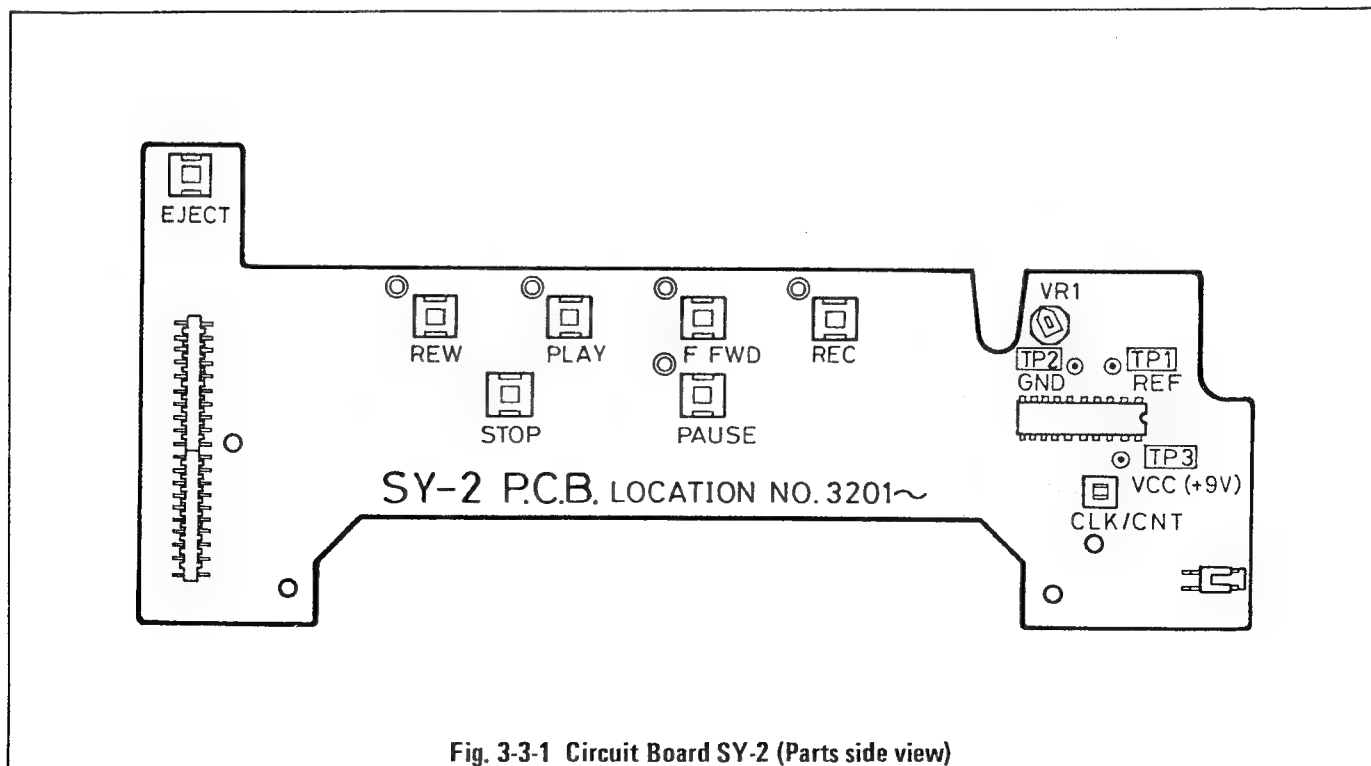


Fig. 3-3-1 Circuit Board SY-2 (Parts side view)

4. SERVO CIRCUIT ADJUSTMENTS

(HEAD SERVO SYSTEM ADJUSTMENTS)

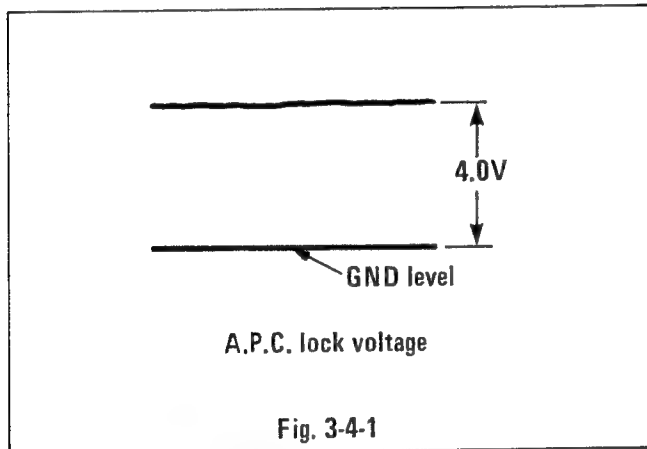
After finishing steps 1 through 5 of this adjustment, repeat step 3 to make the head-switching position adjustment.

1. HEAD-SWITCHING POSITION PRESET

- (1) Set VR4001 and VR4002 to about the middle of their turning range.
- (2) Set the tracking control to the center (click stop) position.

2. A.P.C. LOCK VOLTAGE

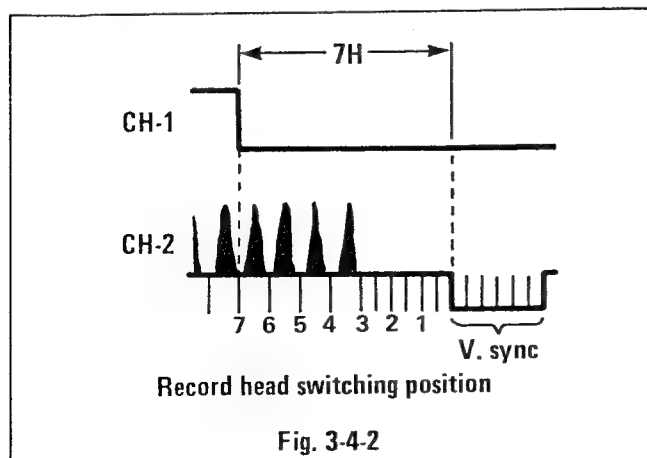
- (1) Insert a cassette. Put the VCR in the β II or β III TV REC mode.
- (2) Connect an oscilloscope or digital voltmeter to TP4002.
- (3) Adjust VR4005 to get 4.0 ± 0.2 V.



3. RECORD HEAD SWITCHING POSITION

- (1) Load a cassette. Put the VCR in the TV REC mode.
- (2) Connect CH-1 of the oscilloscope to TP4003, and CH-2 to TP4007.
- (3) Adjust VR4003 so that the phase of the leading edge of the CH-2 vertical sync signal is delayed 7.0 ± 0.5 H from the fall of the CH-1 waveform.

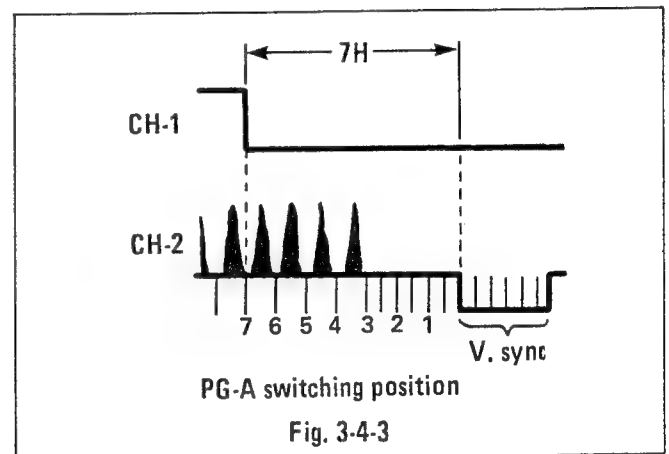
CH-1: RF switching pulse
CH-2: Video signal (vertical sync signal)



4. PG-A SWITCHING POSITION

- (1) Load the alignment tape. Put the VCR in the PLAY mode.
- (2) Connect CH-1 of the oscilloscope to TP4003, and CH-2 to TP4007.
- (3) Adjust VR4001 so that the phase of the leading edge of the CH-2 vertical sync signal is delayed 7.0 ± 0.5 H from the fall of the CH-1 waveform.

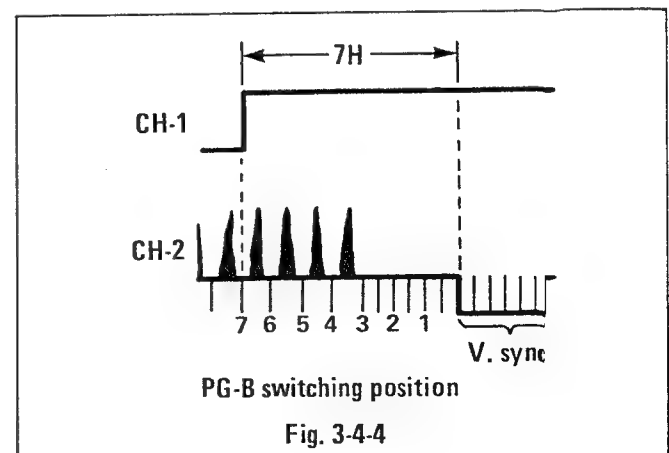
CH-1: RF switching pulse
CH-2: Video signal (vertical sync signal)



5. PG-B SWITCHING POSITION

- (1) Load the alignment tape. Put the VCR in the PLAY mode.
- (2) Connect CH-1 of the oscilloscope to TP4003, and CH-2 to TP4007.
- (3) Adjust VR4002 so that the phase of the leading edge of the CH-2 vertical sync signal is delayed 7.0 ± 0.5 H from the rise of the CH-1 waveform.
- (4) Make a fine adjustment of VR4002 so that the phase difference of the rise and fall of the RF switching pulse is 0.2H or less in relation to the leading edge of the vertical sync signal.

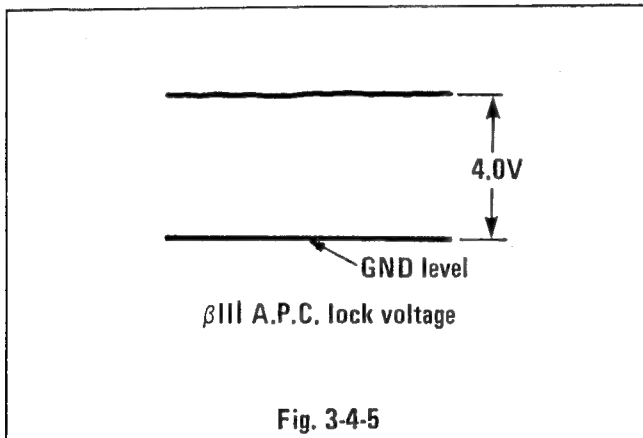
CH-1: RF switching pulse
CH-2: Video signal (vertical sync signal)



(CAPSTAN SERVO SYSTEM ADJUSTMENTS)

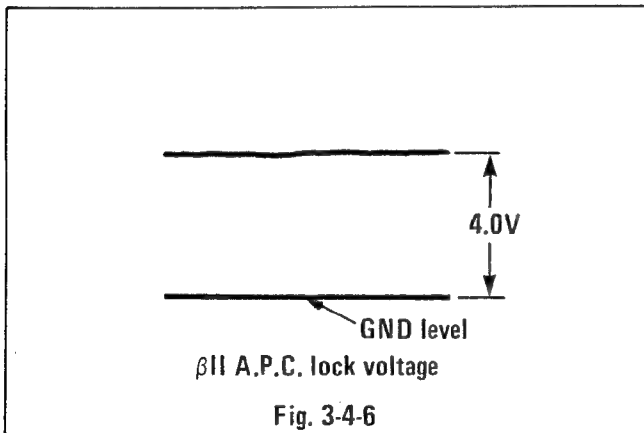
1. β III A.P.C. LOCK VOLTAGE

- (1) Load a cassette. Put the VCR in the β III TV REC mode.
- (2) Connect an oscilloscope or digital voltmeter to TP4005.
- (3) Adjust VR4007 to get $4.0 \pm 0.2V$.



2. β II A.P.C. LOCK VOLTAGE

- (1) Load a cassette. Put the VCR in the β II TV REC mode.
- (2) Connect an oscilloscope or digital voltmeter to TP4005.
- (3) Adjust VR4006 to get $4.0 \pm 0.2V$.



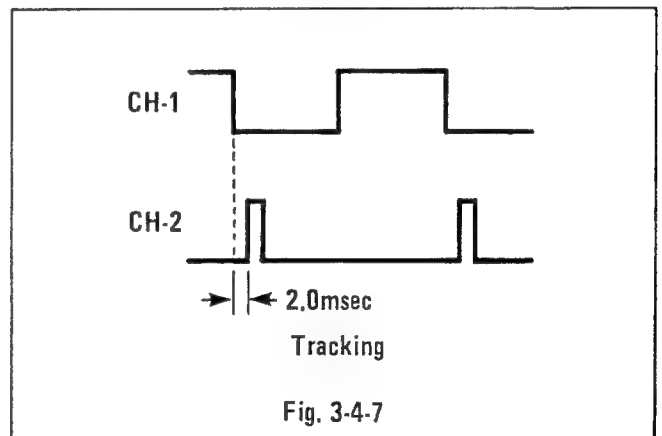
3. TRACKING

- (1) Set the tracking control to the center (click stop) position.
- (2) Load a cassette. Record a TV broadcast at β II or β III, and then put the VCR in the PLAY mode.
- (3) Connect CH-1 of an oscilloscope to TP4003, and CH-2 to TP4006.
- (4) Adjust VR4004 so that the phase difference of the rise of the CH-2 waveform is 2.0 ± 0.5 msec after the fall of the CH-1 waveform.

In this instance, delay the CH-2 waveform.

CH-1: RF switching pulse

CH-2: Control signal (playback CTL pulse)

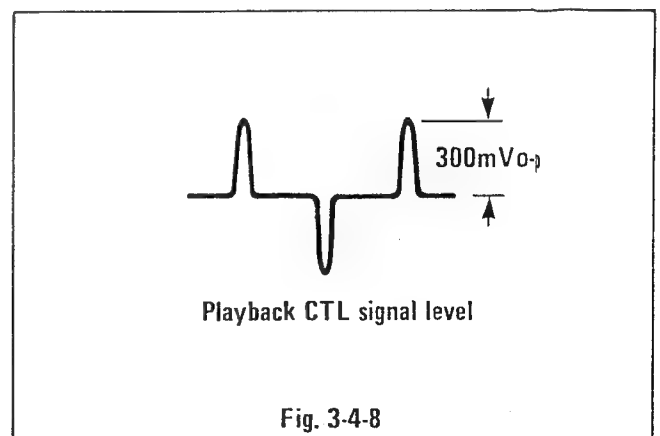


4. PLAYBACK CTL SIGNAL LEVEL

- (1) Load the alignment tape. Put the VCR in the β III REC mode.
- (2) Connect the oscilloscope to TP4004.
- (3) Check to be sure that the peak value of the playback control signal level is $300mV_{o-p}$ or more.

(Caution)

If the peak value is less than the specified value, adjust the tape path.



(STILL-FRAME CIRCUIT ADJUSTMENTS)

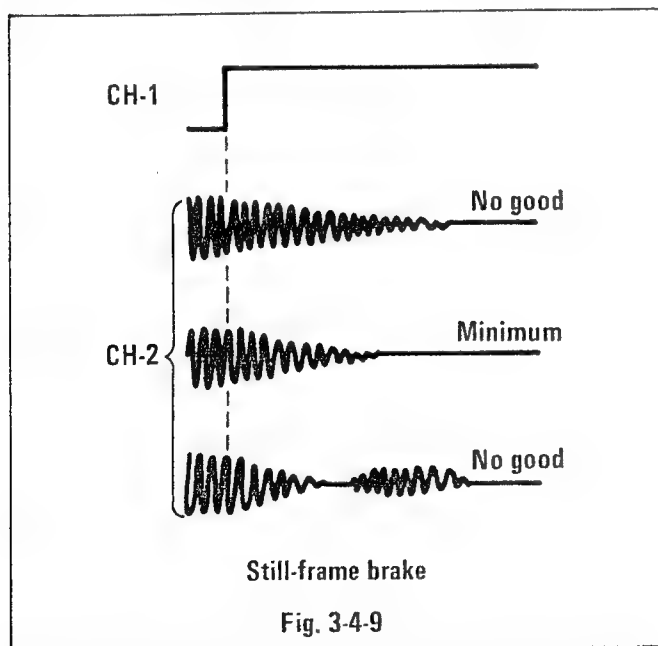
Adjustments of the still-frame circuit are to be made with the VCR in the STILL mode (β III). Adjust each VR while observing the pulses and noise emitted when the unit is switched to the STILL mode.

Before making any adjustments, make the settings described below.

- Set the tracking control to the center (click stop) position.
- Short-circuit the test points of the VD-1 and SV-1 boards.
 - Audio circuit between TP2003 & TP2004
 - Servo circuit between TP4010 & TP4012
- Put the VCR in the β III REC mode. Then record a video signal from a TV broadcast and an audio signal from an audio generator simultaneously (1kHz, -10dBs).

1. STILL-FRAME BRAKE

- (1) Load the cassette recorded at the setting and put the VCR in the β III STILL mode.
- (2) Connect CH-1 of the oscilloscope to TP4009, and CH-2 to the audio output terminal.
- (3) Press the STILL button, apply the trigger at the CH-1 rise, and observe the audio output signal.
- (4) Adjust VR4009 and minimize the waveform attenuation time of the audio output signal.



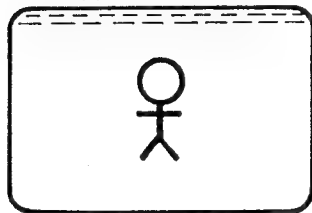
2. STILL-FRAME BRAKE TIMING

- (1) Load the cassette recorded at the setting and put the VCR in the β III STILL mode.
- (2) While pressing the STILL button, observe the noise at the upper and lower edges of the TV screen.
- (3) Turn VR4008. The position of the VR at which noise begins to appear at the upper edge of the screen is point A.
- (4) In the same way, turn VR4008 once again. The position of the VR at which noise begins to appear at the lower edge of the TV screen is point B.
- (5) Then adjust VR4008 to a point half way between point A and point B. This point is point C.
- (6) Turn the tracking control to the left and right, and check to be sure that the center (click stop) position is at the center of the range in which no noise appears on the TV screen.

(Caution)

If the click stop position is not at the center of the no-noise range, make a slight adjustment of point C so that the click-stop position is at the center of the no-noise range.

Setting point A
VR position where noise begins
to appear at upper edge

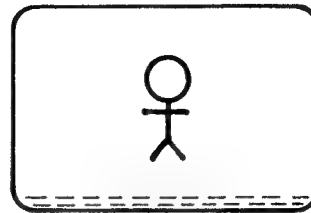


TV screen



Point A

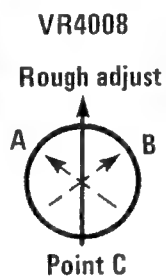
Setting point B
VR position where noise begins
to appear at lower edge



TV screen



Point B



Fine adjustment—Point D

Fig. 3-4-10 Still-frame brake timing

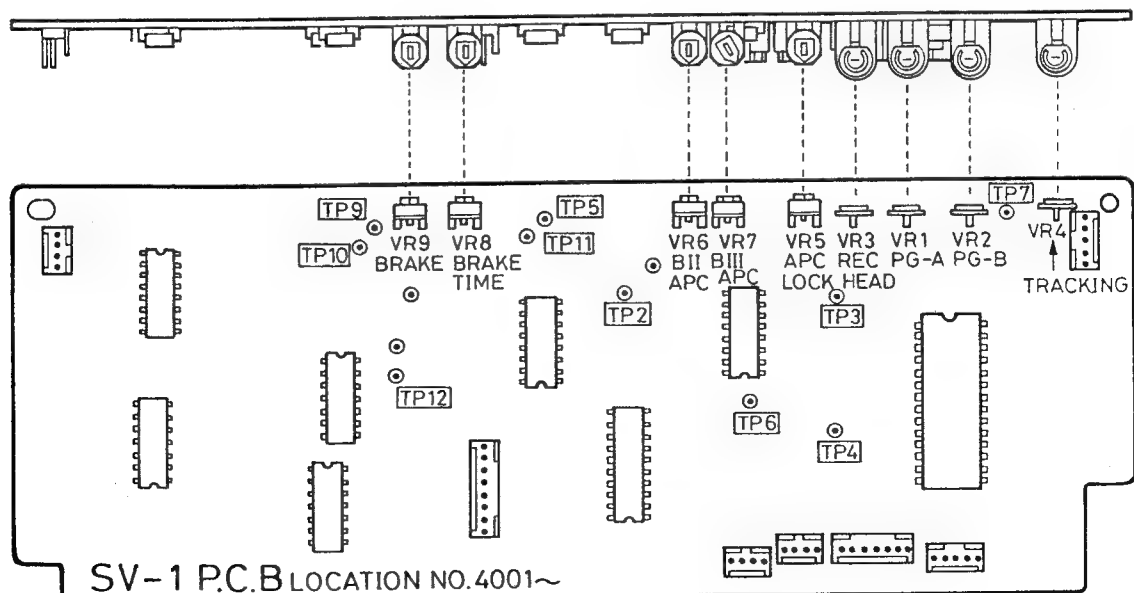


Fig. 3-4-11 Circuit Board SV-1 (Parts side view)

5. VIDEO CIRCUIT ADJUSTMENTS

(ADJUSTMENT CAUTIONS)

There are two types of adjustments of the video circuit: the playback group of adjustments and the recording group of adjustments. The playback group of adjustments are made in the PLAY mode by using an alignment tape. The recording group of adjustments are made in the E-E mode and the REC mode. There are, moreover, Y (luminance) signal adjustments and C (chrominance) signal adjustments both for the playback group of adjustments and for the recording group. The order in which adjustments are to be made is described below.

For video circuit adjustments, it is a basic principle that, if adjustments are not made in the order described below, correct adjustments will not be possible and/or the adjusted value may deviate.

For these reasons, then, if a readjustment is made during the adjustment process, readjustment of all subsequent items will also therefore be necessary.

In particular, items 3, 4, 7, 11 and 12 should be given special attention.

(SETTING BEFORE ADJUSTMENT)

- Connect a color TV to the VHF output terminal.
- Unless otherwise specified, set the tracking control to their center (click stop) positions.
- Check to be sure that the tape path adjustment is normal.

Order	Adjustment	Mode	Y/C
1	Pre-amp. frequency response	PLAY	Y
2	D.O.C. sensitivity	PLAY	Y
3	3.58MHz oscillation frequency	PLAY	C
4	A.G.C.	E - E	Y
5	Comb filter	E - E	Y
6	E - E video output level	E - E	Y/C
7	A.C.C. level	E - E	C
8	4.27MHz B.P.F.	E - E	C
9	Chrominance signal (4.27MHz) carrier leak	E - E	C
10	$(44-1/4)f_H$ V.C.O.	PLAY	C
11	Noise canceller	PLAY	Y
12	Luminance signal playback level	PLAY	Y/C
13	Color (chrominance) signal recording current	REC	C
14	Monochrome (luminance) signal recording current	REC	Y
15	Sync tip carrier frequency and FM frequency deviation	REC	Y
16	Special playback dummy V (vertical) sync insert position	SP. PLAY	Y

Table 3-5-1

1. PRE-AMPLIFIER FREQUENCY RESPONSE

Make this adjustment separately for CH-A and CH-B. The CH-B adjustments are shown in parentheses.

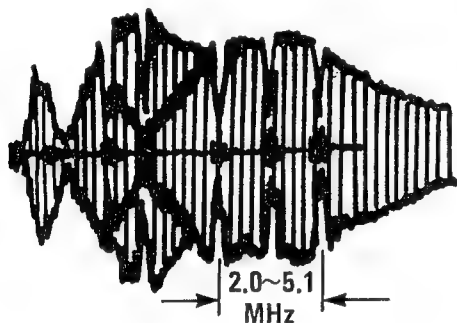
(1) Connect an oscilloscope to TP1001, and connect the external trigger terminal to TP1002.

(2) Playback the β II RF sweep signal part of the alignment tape (VJ-0093). Adjust the tracking control while watching the oscilloscope, and set the tracking position so that the output waveform is maximized.

(3) Adjust VR1001 (VR1002) so that the level is flat between 2MHz and 5.1MHz.

In this instance, adjust so that the level difference is in the $\pm 10\%$ range between 2MHz and 5.1MHz.

VR1001	Equalizer A
VR1002	Equalizer B
TP1001	Envelope
TP1002	RF switching pulse



Pre-amp. frequency response

Fig. 3-5-1

2. D.O.C. SENSITIVITY

(1) Using an already recorded video tape, playback a portion of the tape where dropout is great.

(Caution)

Set the tracking control to the best point.

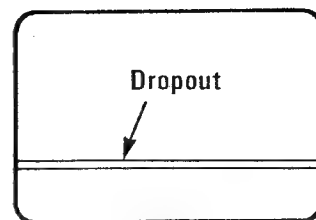
(2) Turn VR1003 all the way to the left (looking from the pattern surface).

(3) While watching the TV screen, turn VR1003 slowly to the right and adjust it to the point where dropout is no longer seen.

(4) Playback the tape once again and check to be sure that dropout has disappeared from the TV screen.

(Caution)

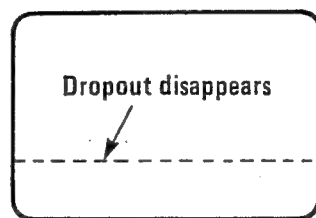
Note that no picture will be seen if VR1003 is turned completely to the right.



TV screen

Dropout compensation (before adjustment)

Fig. 3-5-2



TV screen

Dropout compensation (after adjustment)

Fig. 3-5-3

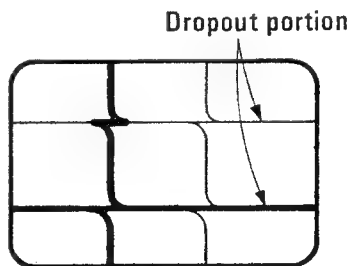
[Adjustments Using the Alignment Tape (VJ-0030)]

(1) Playback the alignment tape (VJ-0030) and set the tracking control to the best point.

(2) Turn VR1003 all the way to the left (looking from the pattern surface).

(3) While watching the TV screen, turn VR1003 slowly to the right, and set it to the point where dropout part A is about half of part B.

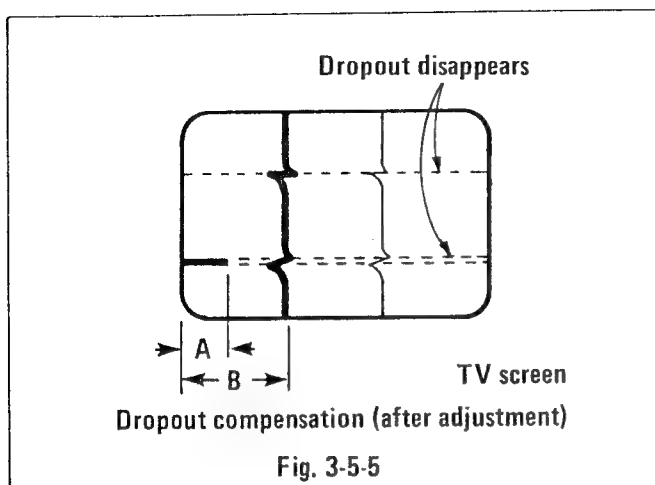
(4) Playback the tape once again and check to be sure that all dropout except part A has disappeared from the TV screen.



TV screen

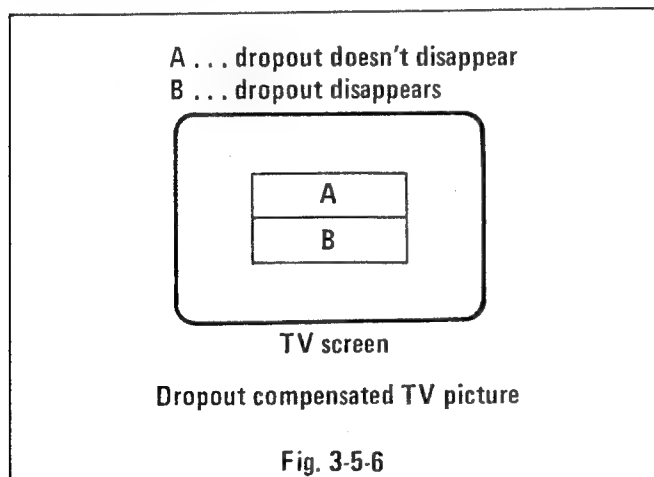
Dropout compensation (before adjustment)

Fig. 3-5-4



[Adjustments Using the Alignment Tape (VJ-0069)]

- (1) Playback the alignment tape (VJ-0069) and set the tracking control to the best point.
- (2) Turn VR1003 all the way to the left (looking from the pattern surface).
- (3) While watching the TV screen, turn VR1003 slowly to the right and make a fine adjustment to the place where dropout disappears from part B, part A is not compensated and noise is minimized.



3. 3.58MHz OSCILLATION FREQUENCY

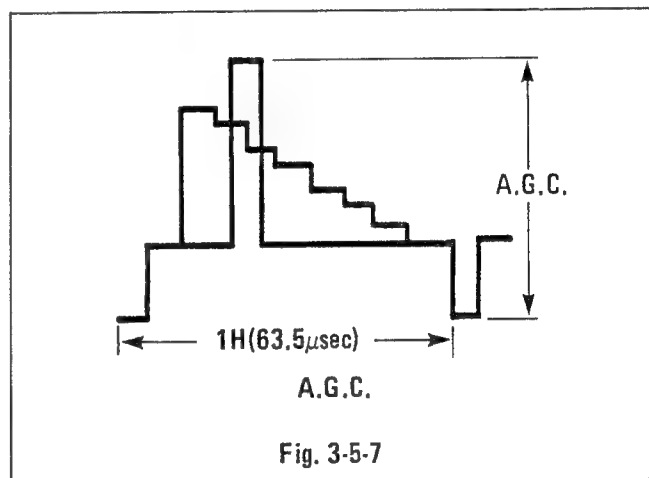
- (1) Play an unrecorded video tape.
- (2) Connect a frequency counter to TP1003.
- (3) Adjust T1007 to $3.579545\text{MHz} \pm 10\text{Hz}$.

(Caution)

The impedance of the frequency counter measuring probe may cause a change in the frequency.

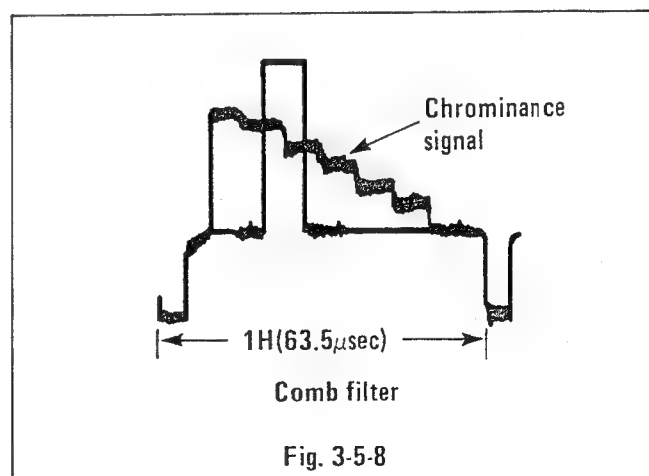
4. A.G.C.

- (1) Input a signal which includes 100% white from a color bar generator, and put the VCR in the STOP mode.
- (2) Connect an oscilloscope to TP1006.
- (3) Turn VR1015 all the way to the left (looking from the pattern surface), and maximize the A.G.C. level.
- (4) Adjust VR1014 to get $0.75 \pm 0.01\text{Vp-p}$.
- (5) Then use the sync level VR on the color bar generator to reduce the sync signal level of the input signal to half.
- (6) Adjust VR1015 to get $0.80 \pm 0.01\text{Vp-p}$.



5. COMB FILTER

- (1) Input a color bar signal and put the VCR in the STOP mode.
- (2) Connect an oscilloscope to TP1005.
- (3) Alternately adjust VR1017 and T1011 so that the level of the chrominance signal of the middle of the luminance signal is minimized (10mVp-p or less).



6. E-E VIDEO OUTPUT LEVEL

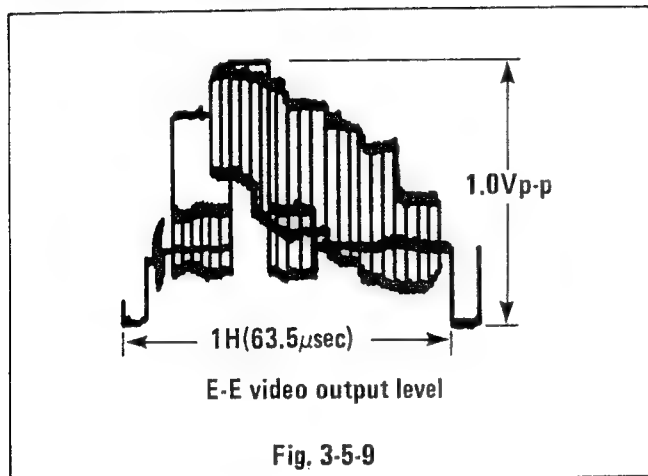
(1) Input a color bar signal and put the VCR in the STOP mode.

(2) Connect an oscilloscope to TP1016.

(3) Adjust VR1008 to get $1.00 \pm 0.05 \text{Vp-p}$.

(Caution)

The video output terminal terminates at 75ohms.

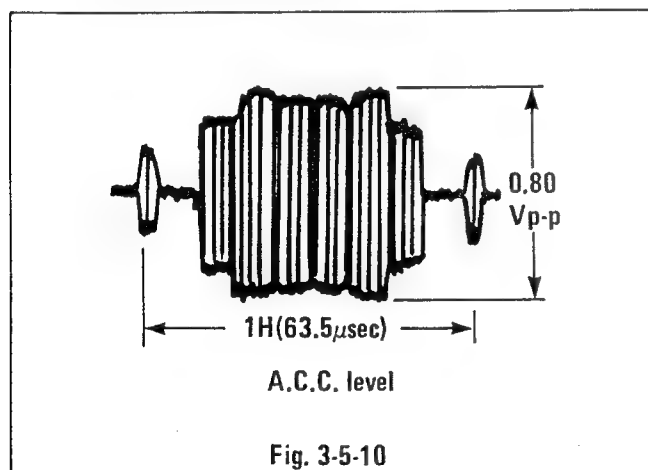


7. A.C.C. LEVEL

(1) Input a color bar signal and put the VCR in the STOP mode.

(2) Connect an oscilloscope to TP1007.

(3) Adjust VR1010 to get $0.80 \pm 0.01 \text{Vp-p}$.

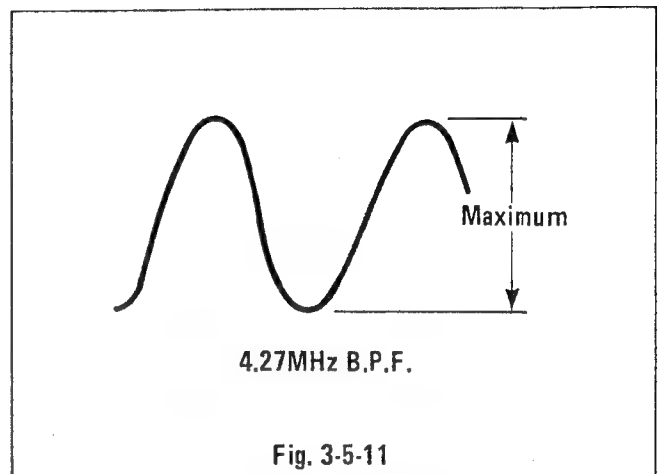


8. 4.27MHz B.P.F.

(1) Input a color bar signal and put the VCR in the STOP mode.

(2) Connect an oscilloscope to TP1008.

(3) Adjust T1008 and T1009 so that the level of the 4.27MHz sine wave is maximized (0.5Vp-p or more).

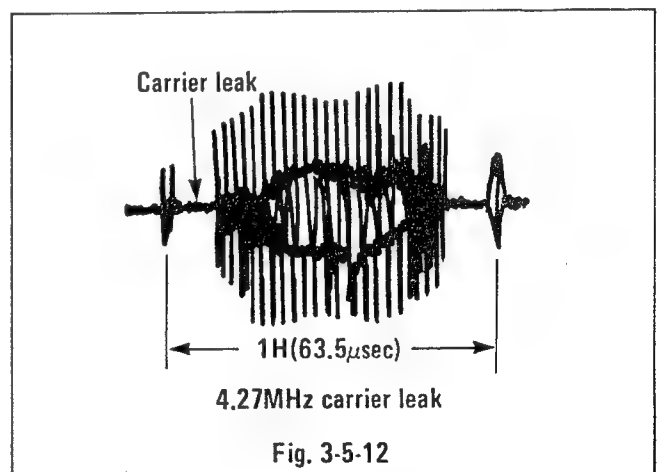


9. CHROMINANCE SIGNAL (4.27MHz) CARRIER LEAK

(1) Input a color bar signal and put the VCR in the STOP mode.

(2) Connect an oscilloscope to TP1009.

(3) Adjust VR1009 so that the 4.27MHz carrier component (level of leakage on base line) is minimized.



10. $(44-1/4)f_H$ V.C.O.

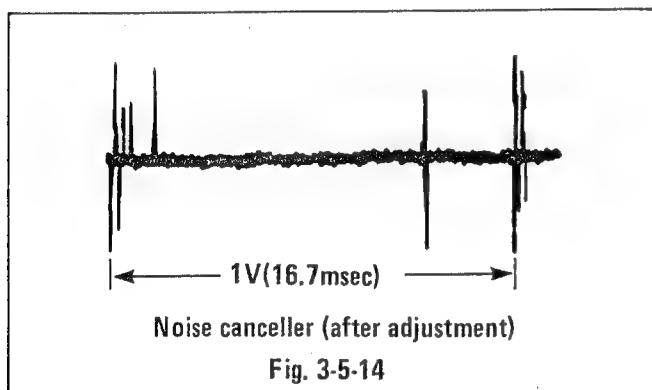
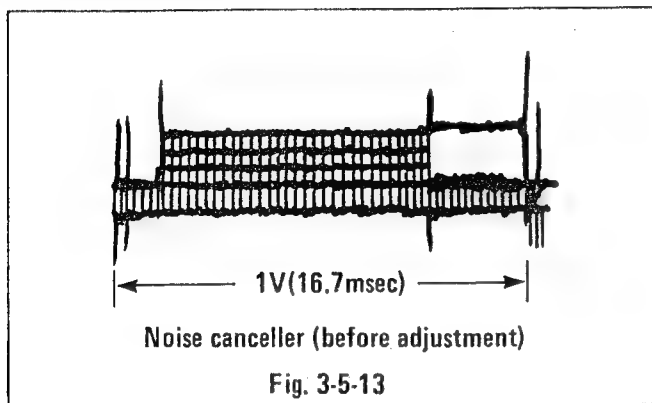
(1) Load the alignment tape. Playback a color bar signal.

(2) Connect a digital voltmeter to TP1011.

(3) Adjust VR1011 to get DC $6.40 \pm 0.05 \text{V}$.

11. NOISE CANCELLER

- (1) Load the alignment tape. Playback a β II color bar signal.
- (2) Connect an oscilloscope to TP1012.
- (3) Adjust VR1006 so that the output waveform is minimized (closest to linear).

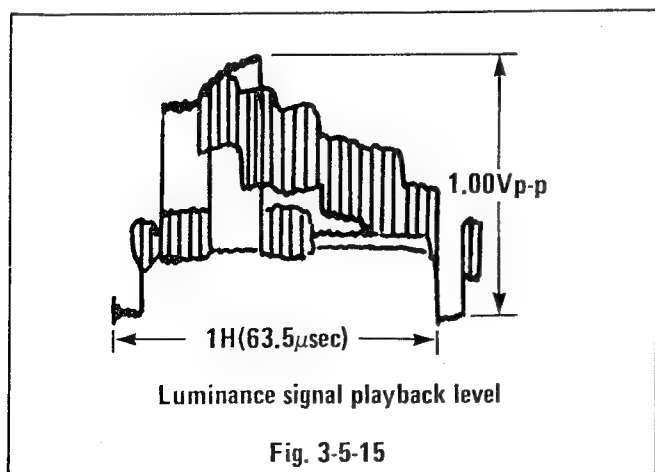


12. LUMINANCE SIGNAL PLAYBACK LEVEL

- (1) Load the alignment tape. Playback a β II color bar signal.
- (2) Connect an oscilloscope to TP1016.
- (3) Adjust VR1007 to get 1.00 ± 0.04 Vp-p.

(Caution)

The video output terminal terminates at 75ohms.

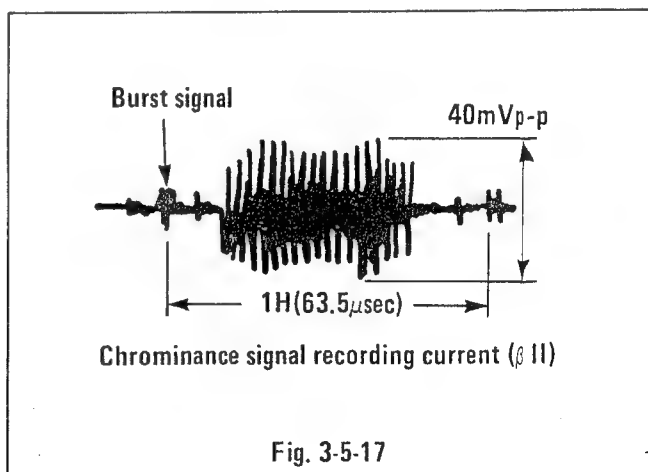
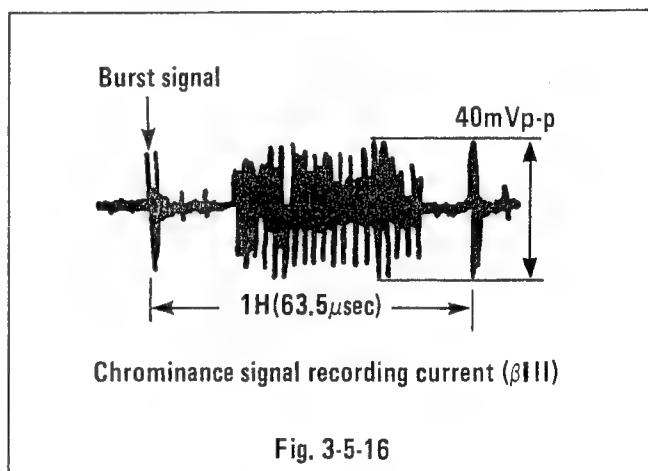


13. COLOR (CHROMINANCE) SIGNAL RECORDING CURRENT

- (1) Input a color bar signal and put the VCR in the REC mode.
- (2) Connect an oscilloscope to TP1014.
- (3) Turn VR1004 all the way to the right (minimum level), looking from the pattern surface.
- (4) Adjust VR1005 so that the chrominance signal recording level at β II is 40 ± 2 mVp-p.
- (5) Check to be sure that the burst signal when the VCR is switched to β II changes approximately 6dB.

(Caution)

Connect the ground probe of the oscilloscope to TP1015. Also note that, because TP1015 is a +B (REC +9V) line, care should be taken.

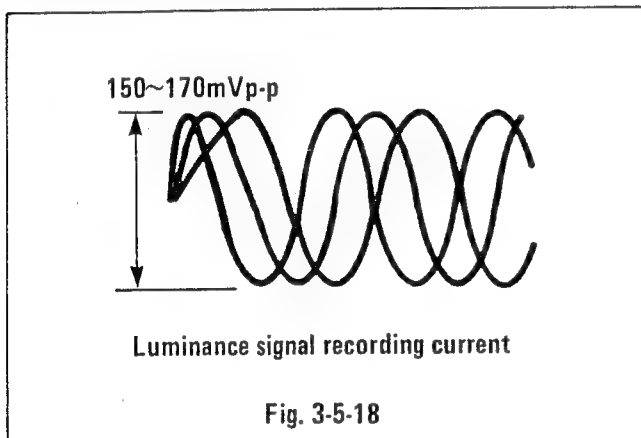


14. MONOCHROME (LUMINANCE) SIGNAL RECORDING CURRENT

- (1) Input a signal which includes 100% white from a color bar generator, and put the VCR in the REC mode.
- (2) Connect an oscilloscope to TP1014.
- (3) Adjust VR1004 to get a luminance signal recording level of 150 ~ 170mVp-p.

(Caution)

In the same way as for adjustment of the chrominance signal recording current, connect the ground probe of the oscilloscope to TP1015.



15. SYNC TIP CARRIER FREQUENCY AND FM FREQUENCY DEVIATION

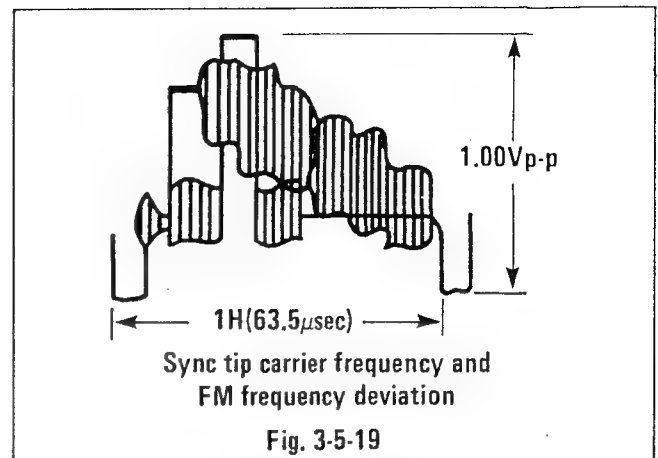
To make this adjustment, alternately make the adjustments described in items (1) through (3) and (4) through (7) below. Repeat this procedure until both adjustment values are satisfied.

- (1) Under conditions of no-signal video input, terminate the video output terminal at 75ohms (with VCR in STOP mode).
- (2) Connect a frequency counter to TP1017.
- (3) Adjust VR1013 to get $3.65 \pm 0.04\text{MHz}$.

(Caution)

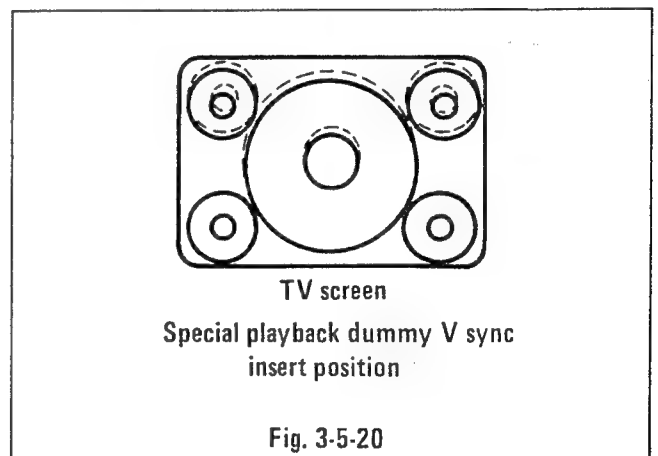
When switching to no-signal input, also open the video input (S1005) from the tuner together with the video input terminal.

- (4) Input a color bar signal, and put the VCR in the REC mode.
- (5) Connect an oscilloscope to TP1016.
- (6) Playback the recorded part, and check to be sure that the output level is $1.00 \pm 0.05\text{Vp-p}$.
- (7) If the output level is not $1.00 \pm 0.05\text{Vp-p}$, adjust VR1012, record a color bar once again, and play it back for confirmation.



16. SPECIAL PLAYBACK DUMMY V (VERTICAL) SYNC INSERT POSITION

- (1) Load a cassette. Record a TV broadcast at βIII .
- (2) Playback the recorded portion, and put the VCR in the STILL mode or the SLOW mode.
- (3) Adjust VR4002 of the servo circuit (SV-1 board) so that the V jitter (very fine movement of the vertical sync) is minimized.



AD-1 P.C.B. LOCATION NO. 2001~

VR1 EQ. A
VR2 EQ. B
VR3 D.O.C.
VR4 V. REC.
VR5 C. REC.
VR6 N. CAN.
VR7 Y. PB.
VR8 E-E LEVEL
VR9 C. LEAK.
VR10 ACC.
VR11 V. CO.
VR12 REC. 1
VR13 CAR. SET
VR14 S. AGC
VR15 P. AGC
VR16 LINE OUT
VR17 C. FIL
VR18 C. FIL
VR19 C. FIL
VR20 C. FIL
VR21 C. FIL
VR22 C. FIL
VR23 C. FIL
VR24 C. FIL
VR25 C. FIL
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VR39 C. FIL
VR40 C. FIL
VR41 C. FIL
VR42 C. FIL
VR43 C. FIL
VR44 C. FIL
VR45 C. FIL
VR46 C. FIL
VR47 C. FIL
VR48 C. FIL
VR49 C. FIL
VR50 C. FIL
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VR97 C. FIL
VR98 C. FIL
VR99 C. FIL
VR100 C. FIL

TP1 ENV.
TP2 RF SW
TP3 GND
TP4 GND
TP5 GND
TP6 GND
TP7 GND
TP8 GND
TP9 GND
TP10 GND
TP11 GND
TP12 REC. 1
TP13 REC. 2
TP14 REC. 3
TP15 REC. 4
TP16 REC. 5
TP17 REC. 6
TP18 REC. 7
TP19 REC. 8
TP20 REC. 9
TP21 REC. 10
TP22 REC. 11
TP23 REC. 12
TP24 REC. 13
TP25 REC. 14
TP26 REC. 15
TP27 REC. 16
TP28 REC. 17
TP29 REC. 18
TP30 REC. 19
TP31 REC. 20
TP32 REC. 21
TP33 REC. 22
TP34 REC. 23
TP35 REC. 24
TP36 REC. 25
TP37 REC. 26
TP38 REC. 27
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TP41 REC. 30
TP42 REC. 31
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TP91 REC. 80
TP92 REC. 81
TP93 REC. 82
TP94 REC. 83
TP95 REC. 84
TP96 REC. 85
TP97 REC. 86
TP98 REC. 87
TP99 REC. 88
TP100 REC. 89

VD-1 P.C.B. LOCATION NO. 1001~

VR1 EQ. A
VR2 EQ. B
VR3 D.O.C.
VR4 V. REC.
VR5 C. REC.
VR6 N. CAN.
VR7 Y. PB.
VR8 E-E LEVEL
VR9 C. LEAK.
VR10 ACC.
VR11 V. CO.
VR12 REC. 1
VR13 CAR. SET
VR14 S. AGC
VR15 P. AGC
VR16 LINE OUT
VR17 C. FIL
VR18 C. FIL
VR19 C. FIL
VR20 C. FIL
VR21 C. FIL
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VR98 C. FIL
VR99 C. FIL
VR100 C. FIL

TP1 ENV.
TP2 RF SW
TP3 GND
TP4 GND
TP5 GND
TP6 GND
TP7 GND
TP8 GND
TP9 GND
TP10 GND
TP11 GND
TP12 REC. 1
TP13 REC. 2
TP14 REC. 3
TP15 REC. 4
TP16 REC. 5
TP17 REC. 6
TP18 REC. 7
TP19 REC. 8
TP20 REC. 9
TP21 REC. 10
TP22 REC. 11
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TP99 REC. 88
TP100 REC. 89

VD-1 P.C.B. LOCATION NO. 1001~

VR10 ACC

T7 358 MHz OSC

T8 4.27 MHz B.P.F.

VR9 C. LEAK

VR8 E-E LEVEL

VR6 N CAN

VR7 Y. PB

VR5 C REC

VR4 Y REC

VR1 EQA

VR2 EQ2

DOC VR3

S7

S5

VR11 V.C.O.

VR15 P. AGC

VR13 CAR SET

VR14 S. AGC

VR12 DEV

VR17 C.FIL

VR18 C.FIL

T11

Q10 E.B

VR04 BIAS LEVEL

VR02 REC/PBOUT

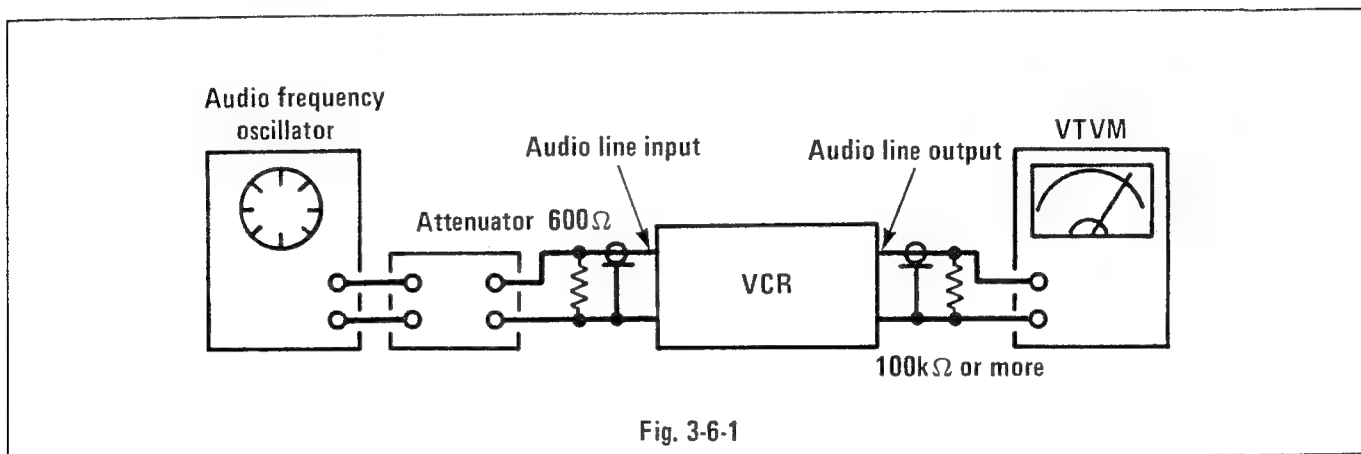
AD-1 P.C.B. LOCATION NO. 2001~

—21—

6. AUDIO CIRCUIT ADJUSTMENTS

As shown in Figure , an audio frequency oscillator, an attenuator and a VTVM are used to make adjustments of the audio circuit. The output signal of the audio frequency oscillator should pass through the attenuator, and then through the input resistance, and be connected to the VCR

audio input terminal (sound line input). The signal from the audio circuit should pass from the audio output terminal (sound line output) to the output resistance; the signal level can be observed on the VTVM.



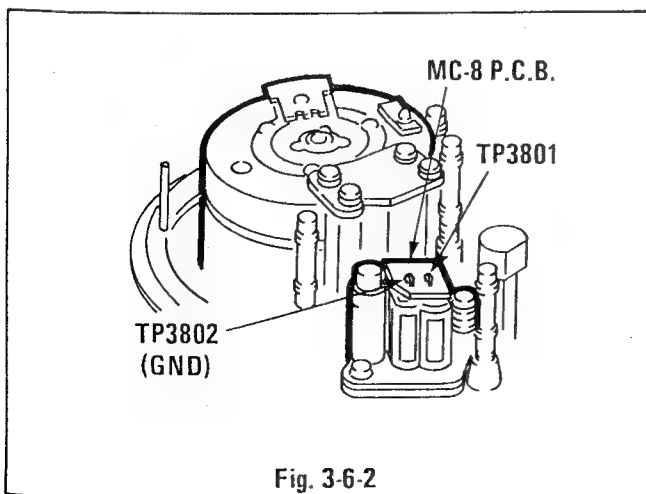
1. BIAS LEVEL AND OSCILLATION FREQUENCY CHECK

- (1) Load a cassette. Put the VCR in the no-signal REC mode.
- (2) Connect the VTVM to MC-8 board (100ohm both ends) TP3801 and TP3802.
- (3) Adjust VR2004 to get 36mV.
- (4) Connect a frequency counter to TP3801 and TP3802.
- (5) Check to be sure that there is an oscillation frequency of 70 ± 5 kHz.

(Cautions)

- The no-signal REC mode is obtained by connecting only a plug to the audio input terminal, and then putting the VCR in the REC mode while thus interrupting the input signal.
- The VTVM and frequency counter are connected as follows:

Measurement probe: TP3801
Ground probe: TP3802



2. A.L.C. OUTPUT CHECK

- (1) Connect the audio frequency oscillator to the audio input terminal, and set for an oscillation output of 1kHz, -10dBs.
- (2) Connect the VTVM to the audio output terminal.
- (3) Wait for the reference input in item (1) to stabilize, and then set each input level relative to the reference input as described below, and check to be sure that the standard is satisfied.

Input level	Output level
+20dB	-4 \pm 2dBs
\pm 0dB	-4.5 \pm 1.5dBs
-20dB	-13 \pm 4dBs

3. RECORDING CURRENT LEVEL CHECK

- (1) Connect the audio frequency oscillator to the audio input terminal, and set for an oscillation output of 1kHz, -10dBs.
- (2) Connect the VTVM to TP3801 and TP3802.
- (3) Short-circuit between Q2010 base and emitter or between TP2001 and TP2002, and stop the bias.
- (4) Load a cassette. Put the VCR in the β II REC mode.
- (5) Check to be sure that the recording current level of 3.2 ± 0.6 mV.

4. OVERALL FREQUENCY RESPONSE CHECK

- (1) Connect the audio frequency oscillator to the audio input terminal, and set for an oscillation output of 1kHz, -10dBs.
- (2) Connect the VTVM to the audio output terminal.
- (3) Wait for the reference input in item (1) to stabilize, and then reduce the input level 30dB relative to reference input.
- (4) Load a cassette. Put the VCR in the β II or β III REC mode.
- (5) Set the oscillation frequency of the audio frequency oscillator as shown in the figure at the right, and make a recording of each for about 10 seconds.
- (6) Playback the cassette recorded at β II or β III, and check to be sure that the playback output level of each frequency is within the standard range shown in the figure below.

(Caution)

If the output level of the high frequency range (6kHz or higher) is not within the reference range (β II or β III frequency response), readjust the bias level as described below:

- If the upper limit of the high frequency range is not satisfied:
Raise the bias level to 39mV.
- If the lower limit of the high frequency range is not satisfied:
Lower the bias level to 33mV.

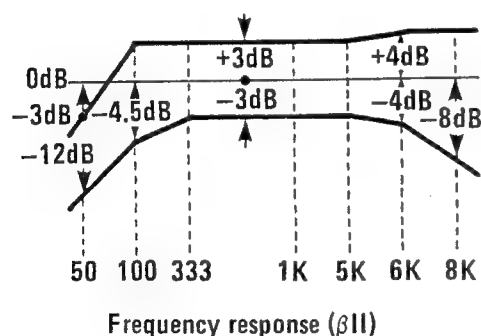


Fig. 3-6-3

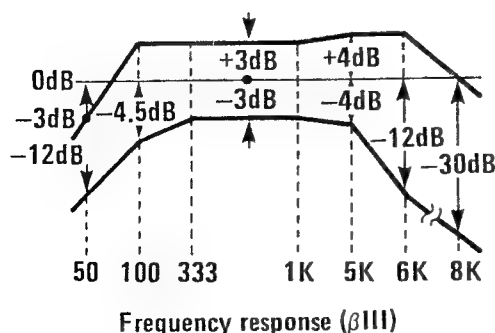


Fig. 3-6-4

5. RECORDING/PLAYBACK OUTPUT

- (1) Connect the audio frequency oscillator to the audio input terminal, and set for an oscillation output of 1kHz, -10dBs.
- (2) Connect the VTVM to the audio output terminal.
- (3) Wait for the reference input in item (1) to stabilize, and then put the VCR in the β II REC mode.
- (4) Adjust VR2002 so that the recorded 1kHz output level becomes -5dBs in the PLAY mode.
- (5) Check, by following items (1) through (3) above, to be sure that the playback output level of a β III recording is -5 ± 2 dBs.

6. PLAYBACK AUDIO LEVEL CHECK

- (1) Playback the alignment tape (VJ-0126).
- (2) Connect the VTVM to the audio output terminal.
- (3) Check to be sure that the β II audio playback level is -5 ± 2 dBs.

7. S/N RATIO CHECK

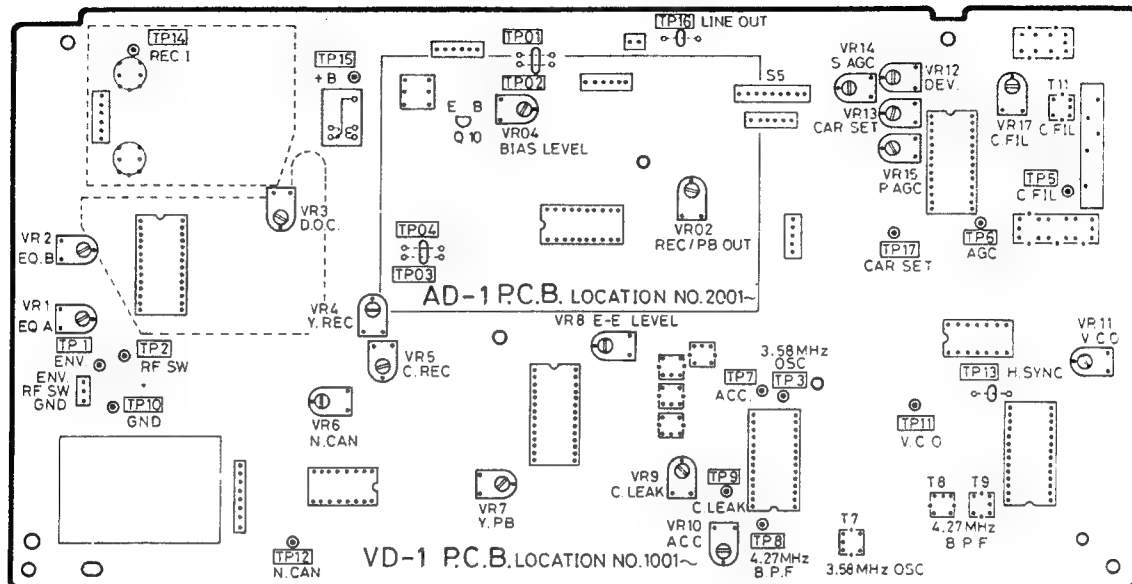
- (1) Connect the audio frequency oscillator to the audio input terminal, and set for an oscillation output of 1kHz, -10dBs.
- (2) Connect the VTVM to the audio output terminal.
- (3) Wait for the reference input in item (1) to stabilize, and then put the VCR in the β II REC mode.
- (4) After recording a 1kHz signal for about 5 digits on the tape counter, cut the input signal and then record the no-input signal in the same way for about 5 digits.

(Caution)

A no-input signal is obtained by inserting a short plug in the audio input terminal and reducing the VCR noise level.

- (5) Playback the recorded part of the tape.
- (6) Check to be sure that the difference between the 1kHz signal level and the noise level is 40dB or more.
- (7) In the same way, measure the S/N ratio at β III, and check to be sure that it is 38dB or more.

(Foil side view)



(Parts side view)

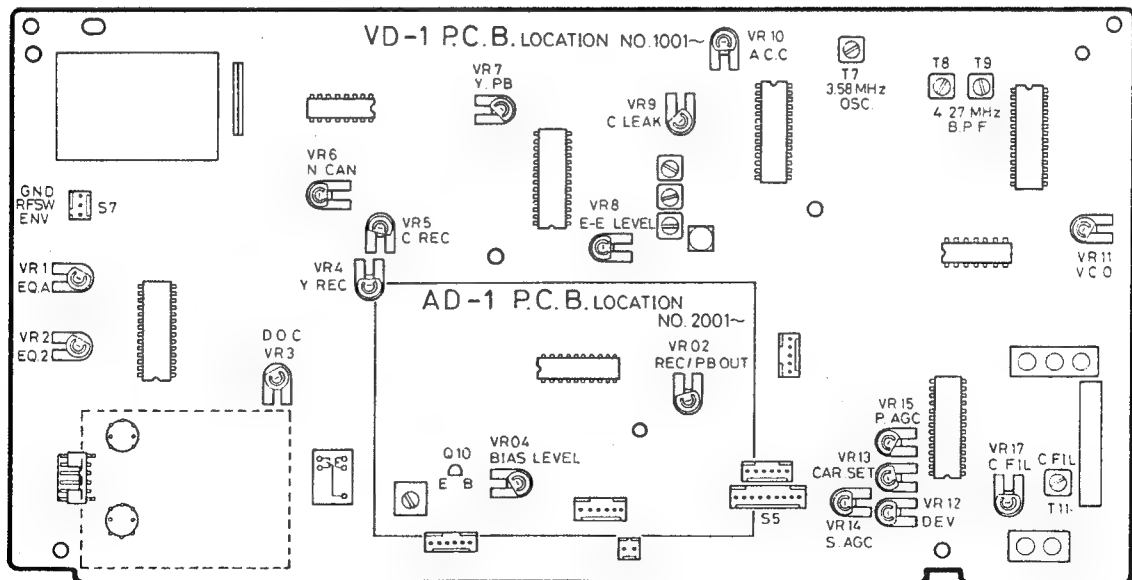


Fig. 3-6-5 Circuit Board VD-1, AD-1

7. TIMER CIRCUIT CHECKS

1. TIMER +10V CHECK

- (1) Connect a digital voltmeter to (7) and (8) of P7002.
Digital voltmeter + terminal: P7002 (7)
Digital voltmeter - terminal: P7002 (8)
- (2) Check to be sure that there is DC $+10 \pm 1V$.

2. TIMER -20V CHECK

- (1) Connect a digital voltmeter to (8) and (3) of P7002.
Digital voltmeter + terminal: P7002 (8)
Digital voltmeter - terminal: P7002 (3)
- (2) Check to be sure that there is DC $-20 \pm 3V$.

3. FILAMENT VOLTAGE CHECK

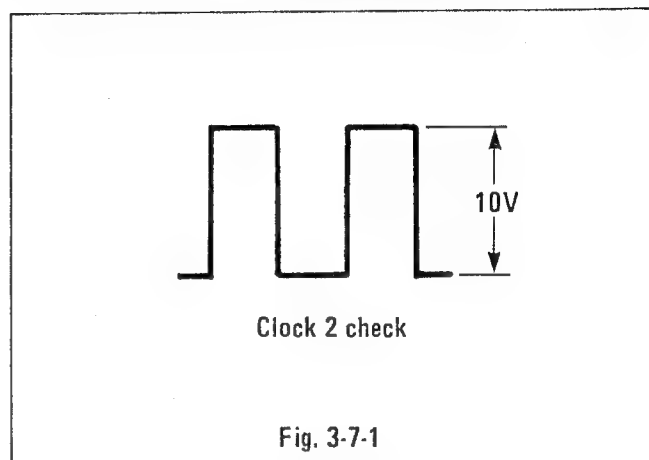
- (1) Switch the digital voltmeter to the AC voltage measurement mode, and connect to pins (1) and (25) of the fluorescent indicator tube.
- (2) Check to be sure that there is AC $2.4 \pm 0.24V$.

4. CLOCK 1 (X_{IN}) CHECK

- (1) Connect an oscilloscope to pin (18) of IC7001.
- (2) Check to be sure that the sine wave is near but not exactly 500kHz.

5. CLOCK 2 (60Hz) CHECK

- (1) Connect an oscilloscope to pin (7) of IC7001.
- (2) Check to be sure that there is a 60Hz rectangular wave the same as the AC power supply frequency.



6. RESET INPUT (L LEVEL) INPUT CHECK

- (1) Connect a digital voltmeter to pin (9) of IC7001.
- (2) Check to be sure that there is a sawtooth wave when the power switch is switched ON, and that there is 0V (L level) during normal operation.

8. TUNER CIRCUIT ADJUSTMENTS

1. A.F.T.-1

- (1) Tune to any TV broadcast.
- (2) Switch the AFT switch to OFF.
- (3) Turn the tuning VR to the left and right, and adjust so that the sound (920kHz) beat signal disappears from the TV screen.
- (4) Switch the AFT switch to ON.
- (5) Adjust T6102 so that the sound (920kHz) beat signal disappear.

(Caution)

Turn T6102 to the left and right while observing the TV screen, and, after confirming that the sound beat appears, make the adjustment so that it cannot be seen.

(6) Switch the tuning switch to receive each of the TV broadcasts to which the VCR has been preset.

(7) Observe the TV screen for each TV broadcast, and check to be sure the sound beat has disappeared and that the color has not.

(Caution)

If any of the above conditions are recognized on the TV screen, readjust T6102.

2. A.F.T.-2

(1) Disconnect (no-input condition) the VCR's TV antenna input (VHF and UHF input terminals).

(2) Connect a digital voltmeter between TP6115 and TP6116.

(3) Adjust VR6102 so that the voltage between TP6115 and TP6116 is DC $0 \pm 0.5V$.

3. RF A.G.C.

(1) Tune to any TV broadcast. Adjust the monitor TV to emphasize the TV screen contrast.

(2) Turn VR6101 to the left and right and adjust so that the snow noise on the TV screen disappears.

(Caution)

Turn VR6101 to the left and right while observing the TV screen, and, after confirming that snow noise appears, make the adjustment so that it cannot be seen.

(3) Switch the tuning switch to receive each of the TV broadcasts to which the VCR has been preset.

(4) Observe the TV screen for each TV broadcast, and check to be sure that there is no snow noise, tearing or beat interference caused by cross-modulation.

(Caution)

If any of the above conditions are recognized on the TV screen, readjust VR6101.

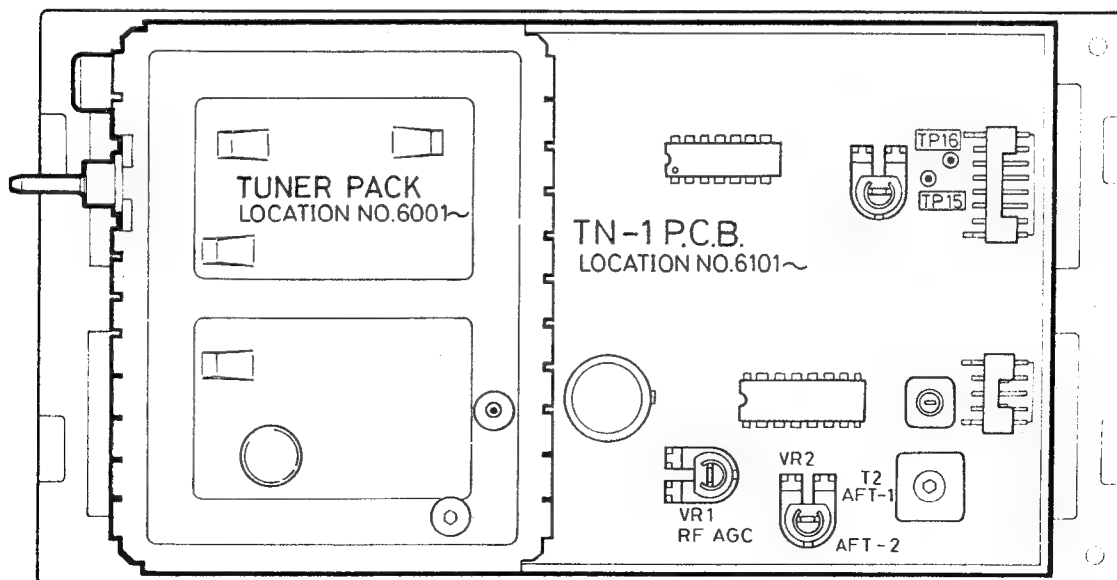
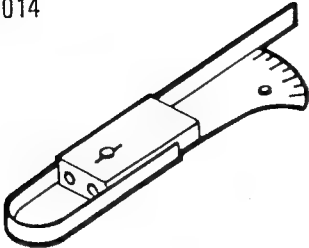
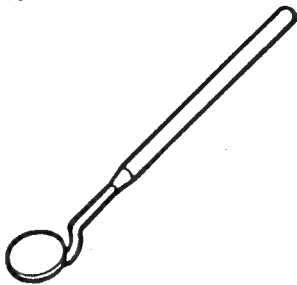
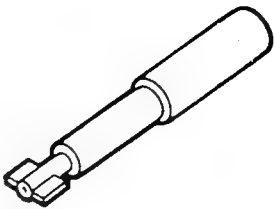
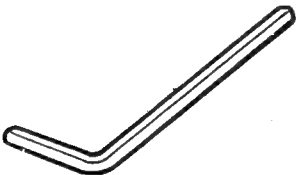
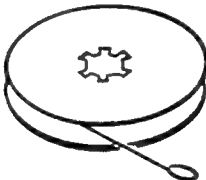
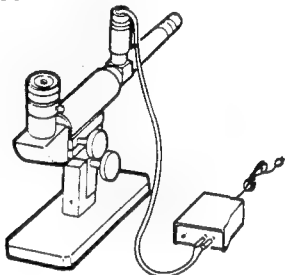
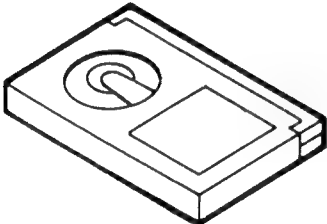
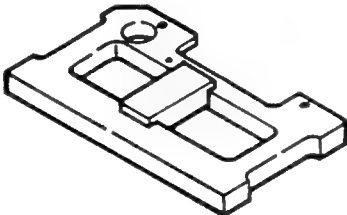

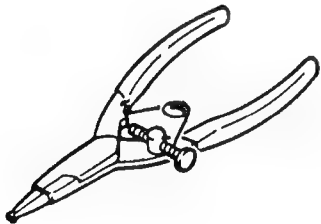
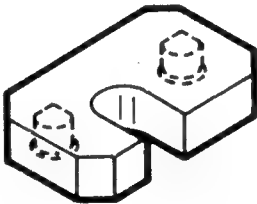
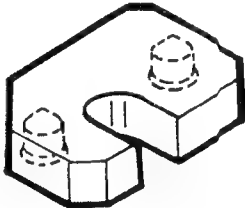
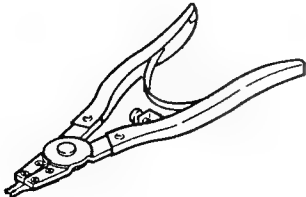



Fig. 3-8-1 Circuit Board TN-1 (Parts side view)

4. MECHANISM ADJUSTMENT

1. JIGS AND TOOLS FOR ADJUSTMENT

No.	Names	Jig. No.	Remarks
1	Spring tension gauge (100 gram)	VJ-0012	Measurement for FWD (PLAY), R-SEARCH take-up torque
2	Spring tension gauge (500 gram)	VJ-0014	Measurement for F FWD, REW take-up torque
3	Inspection mirror	VJ-0015	Tape path alignment
4	Eccentric screwdriver	VJ-0017	Tape path alignment
5	Hexagonal wrench (M3)	VJ-0022	Adjustment of back tension guide
6	Tension gauge for reel	VJ-0038	Measurement for all winding torque
7	Microscope	VJ-0063	Confirmation and adjustment of the level difference between video heads A and B
8	Alignment tape	VJ-0093	Tape path alignment
9	Cassette stand plate gauge	VJ-0105	Adjustment of reel height
10	Hexagonal wrench (M2.6)	VJ-0108	Installation of reel motor pulley
11	Grip ring pincher	VJ-0109	For attaching/detaching grip ring (more than 4mm)
12	Position adjustment gauge	VJ-0120	Adjustment of back tension guide
13	Checker adjustment gauge	VJ-0121	Adjustment of back tension guide
14	Grip ring pincher (small)	VJ-0128	For attaching/detaching grip ring (3mm only)
15	Grip ring pincher head	VJ-0128-1	Spare head of grip ring pincher VJ-0128

<p>VJ-0012 VJ-0014</p>  <p>No. 1, No. 2</p>	<p>VJ-0015</p>  <p>No. 3</p>	<p>VJ-0017</p>  <p>No. 4</p>
<p>VJ-0022</p>  <p>No. 5</p>	<p>VJ-0038</p>  <p>No. 6</p>	<p>VJ-0063</p>  <p>No. 7</p>
<p>VJ-0093</p>  <p>No. 8</p>	<p>VJ-0105</p>  <p>No. 9</p>	<p>VJ-0108</p>  <p>No. 10</p>
<p>VJ-0109</p>  <p>No. 11</p>	<p>VJ-0120</p>  <p>No. 12</p>	<p>VJ-0121</p>  <p>No. 13</p>
<p>VJ-0128</p>  <p>No. 14</p>	<p>VJ-0128-1</p>  <p>No. 15</p>	

2. PREPARATIONS FOR ADJUSTMENT

1. REMOVAL FRONT LOADING MECHANISM ASSEMBLY (See Fig. 4-2-1)

- (1) Remove the connectors from the MC-9 circuit board.
- (2) Remove the connectors for the cassette motor.
- (3) Remove the 4 screws (a) and the 1 screw (b) holding the front loading mechanism assembly and reel chassis.

- (4) Move the front loading mechanism assembly about 5 mm in the direction of the arrow, and remove it by lifting it up.

(Caution)

When removing the front loading mechanism assembly from the reel chassis, be sure to hold the top board A to remove it.

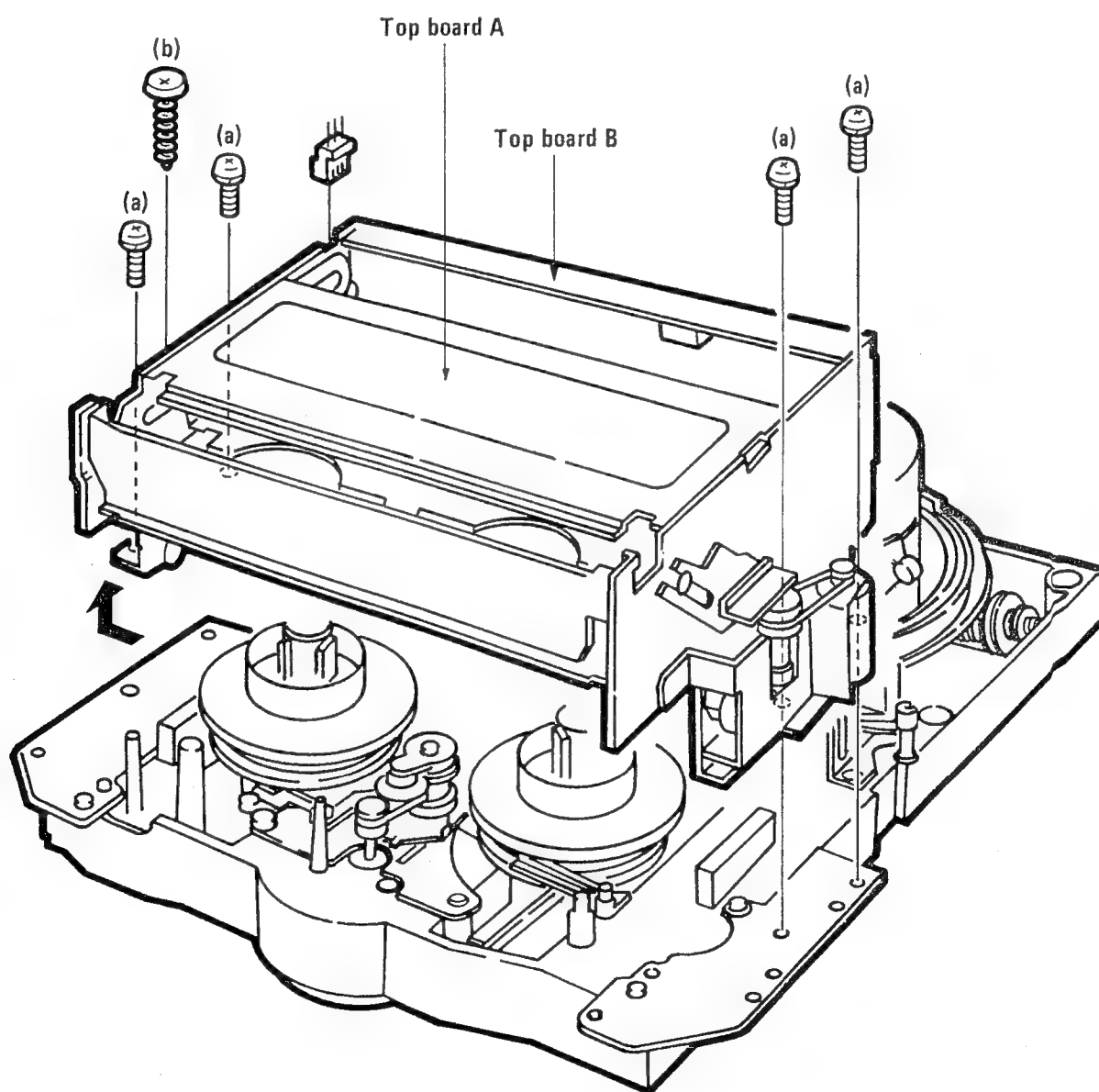


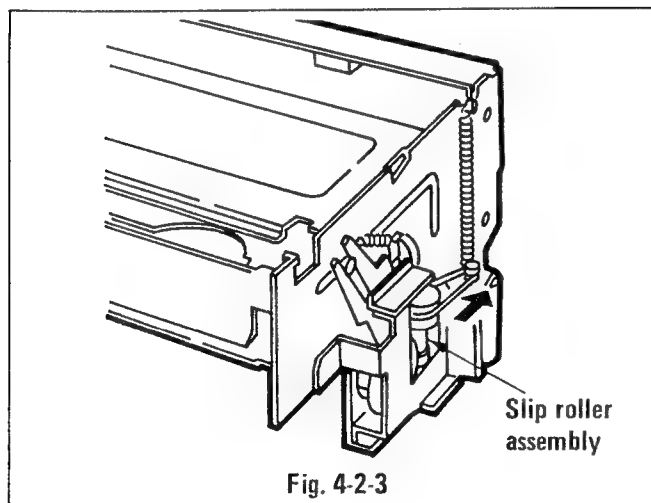
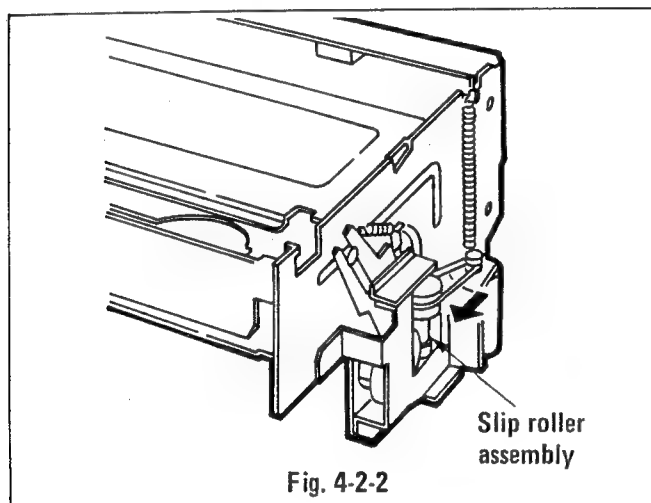
Fig. 4-2-1

2. DIRECTION OF MOVEMENT OF THE CASSETTE HOLDER FOR MANUAL OPERATION

- (1) Remove the cabinet and the tuner circuit board.
- (2) When inserting a cassette, turn the slip roller assembly in the direction of the arrow (clockwise). (See Fig. 4-2-2)
- (3) When removing a cassette, turn the slip roller assembly in the direction of the arrow (counter clockwise). (See Fig. 4-2-3)

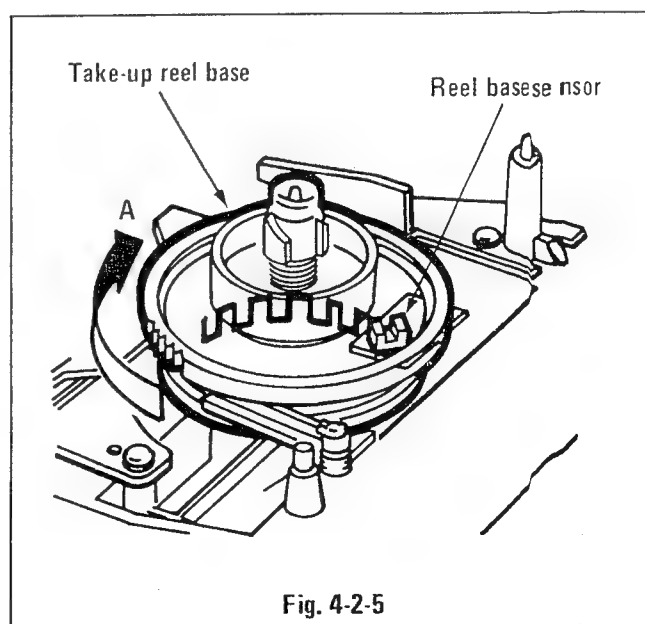
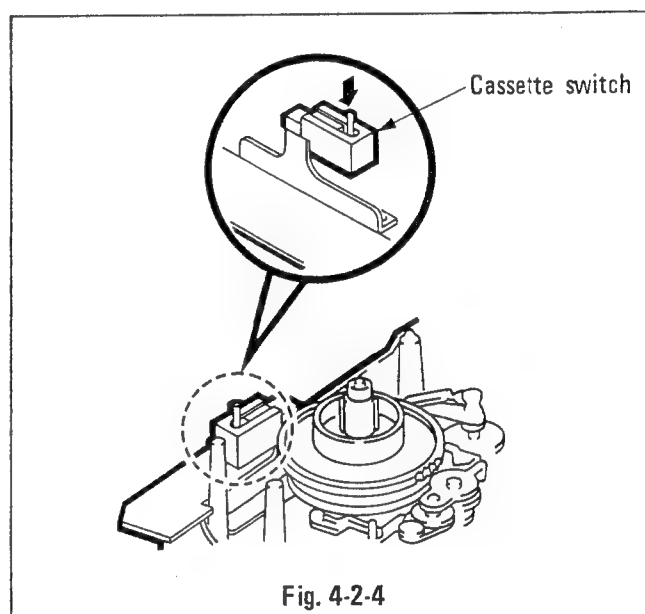
(Caution)

When turning the slip roller assembly either clockwise or counter clockwise, be careful not to touch the belt with your finger, etc.



3. OPERATION OF THE VCR ONCE THE FRONT LOADING MECHANISM ASSEMBLY HAS BEEN REMOVED (See Figs. 4-2-4, 4-2-5.)

- (1) Turn on the power.
- (2) Press the cassette switch in the direction of the arrow. (When the cassette switch is not continuously pressed it will not function.) Perform adjustment for tape path with the F.L. mechanism assembly attached.
- (3) The mode will change in accordance with the operation button which is pressed.
- (4) In both the REW and R-SEARCH modes, the safety mechanism will function if the take-up reel base does not rotate, therefore, manually rotate the take-up reel base clockwise (direction A). (See Fig. 4-2-5)



[Manual Rotation of the Loading Ring] (See Figs. 4-2-6 ~ 4-2-8.)

(1) To load, manually rotate the loading motor pulley in the direction of arrow A, and the loading ring will rotate counter clockwise.

(2) At the completion of the loading condition, the loading ring stopper will function to stop the loading ring rotation. (See Fig. 4-2-7.)

(3) To unload, manually rotate the loading motor pulley in the direction of arrow B, and the loading ring will rotate clockwise.

(4) At the completion of the unloading condition, the loading ring stopper will function to stop the loading ring rotation. (See Fig. 4-2-8.)

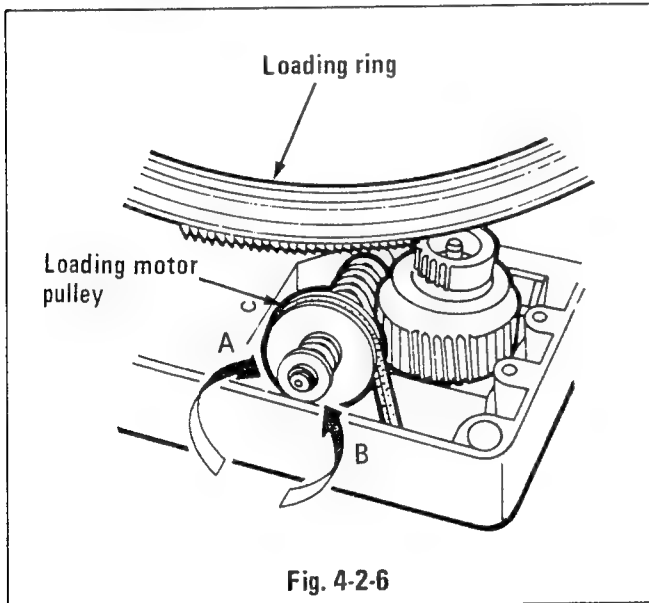


Fig. 4-2-6

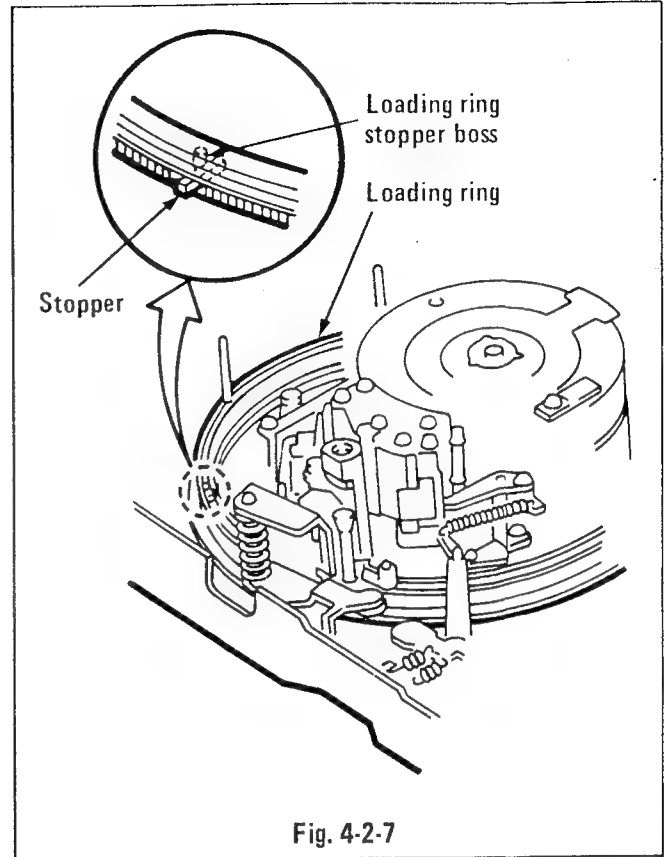


Fig. 4-2-7

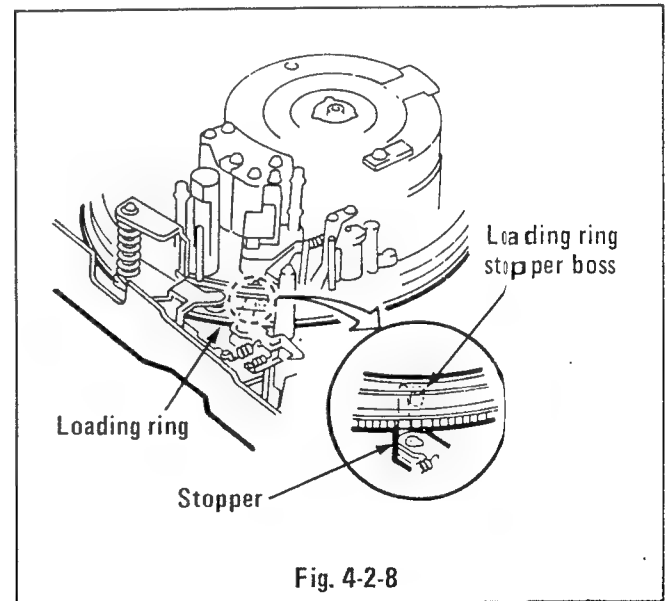


Fig. 4-2-8

3. MAINTENANCE TIMETABLE

Parts \ Time (Hours)	500	1000	1500	2000	2500	3000	3500	4000	5000
Video head	△	△	△	△	△	△	△	△	△
Audio/control head Audio erase head	△	△	△	△	△	△	△	△	△
Pinch roller, capstan	△	△	△	△	△	△	△	△	△
Full erase head	△	△	△	△	△	△	△	△	△
Supply reel base				▲				▲	
Take-up reel base				▲				▲	
PLAY gear		▲		▲		▲		▲	
F FWD/REW roller		▲		▲		▲		▲	
Center gear		▲		▲		▲		▲	

△ Cleaning methyl alcohol

▲ Lubrication specified lubricant

Table 4-3-1

4. MECHANISM REPAIR AND PARTS REPLACEMENT

Before replacing any of the following parts, be sure to turn off the power [set the power switch to the OFF position or pull out the power cord from the output.]

- * Video head drum (video head motor)
- * Video head
- * Audio/control head
- * Full-erase head
- * Micro switches (cassette-in, loading I, loading II, erasure prevention)
- * Reel motor
- * Capstan motor
- * Loading motor
- * Front loading motor
- * Tape end sensors (FWD, REW)
- * DEW sensor
- * Reel base sensor

(Caution)

Be especially sure that the power is off [the power switch is in the OFF position] when connecting or disconnecting the connectors of the video head drum and of the capstan motor. If one of these connectors is connected or disconnected while the power is on [the power switch is in the ON position] the internal ICs will be damaged.

1. VIDEO HEAD (See Fig. 4-4-1.)

- (1) Turn off the power. [Set the power switch to the OFF position.]
- (2) Move the video head drum to a position at which the video heads are easy to clean.
- (3) Wipe each head several times with the deerskin part of the head cleaning stick. If the heads are extremely dirty, wipe more times.

(Caution)

- * When pressing a finger on the head cleaning stick to clean the heads, do not press too hard.
- * Do not move the head cleaning stick up and down against the video heads; doing so will damage the heads.

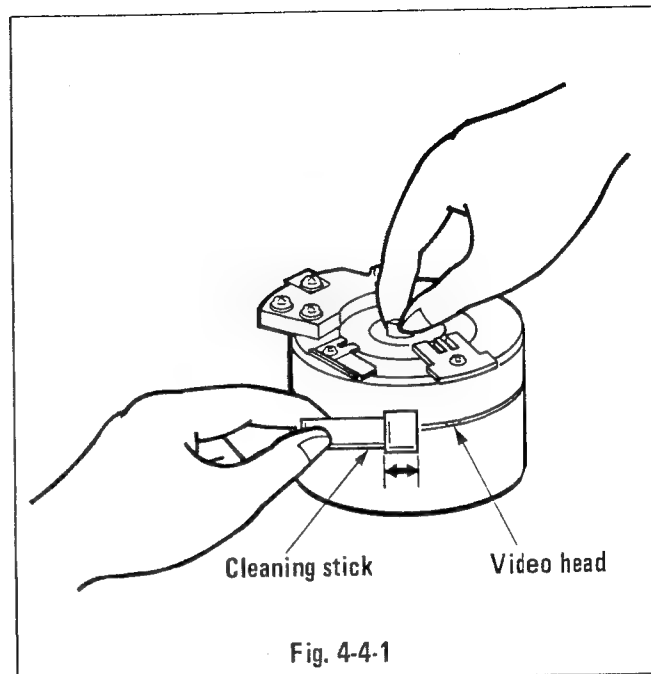


Fig. 4-4-1

2. CLEANING THE AUDIO/CONTROL HEAD AND FULL-ERASE HEAD (See Figs. 4-4-2, 4-4-3.)

Apply alcohol to the cleaning stick, and move the cleaning stick against the heads in the direction of the head gap.

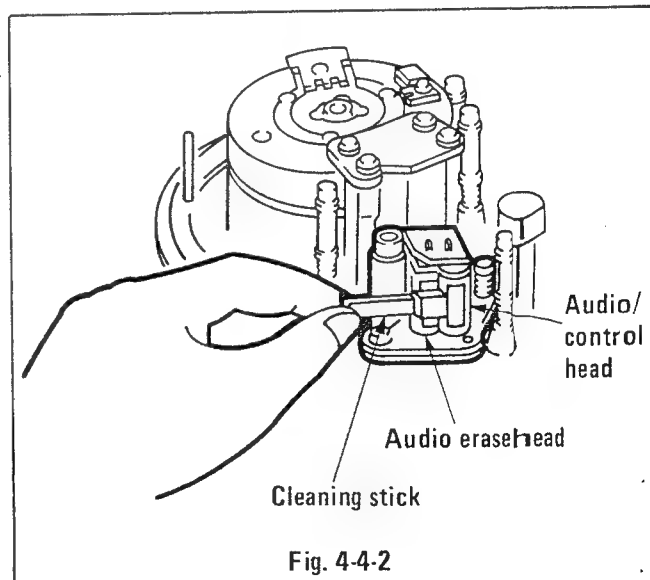
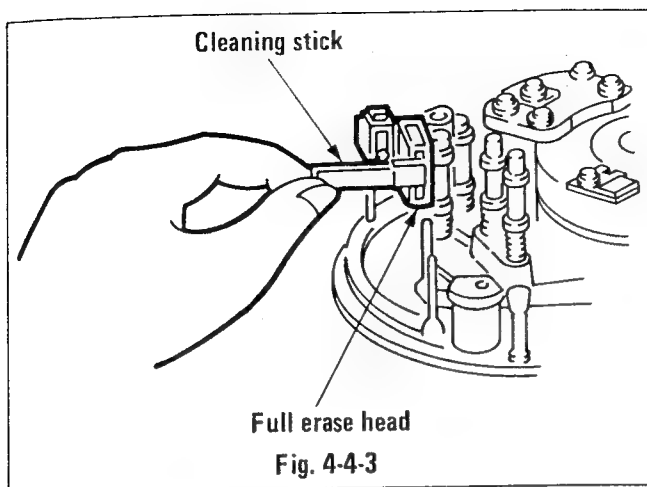
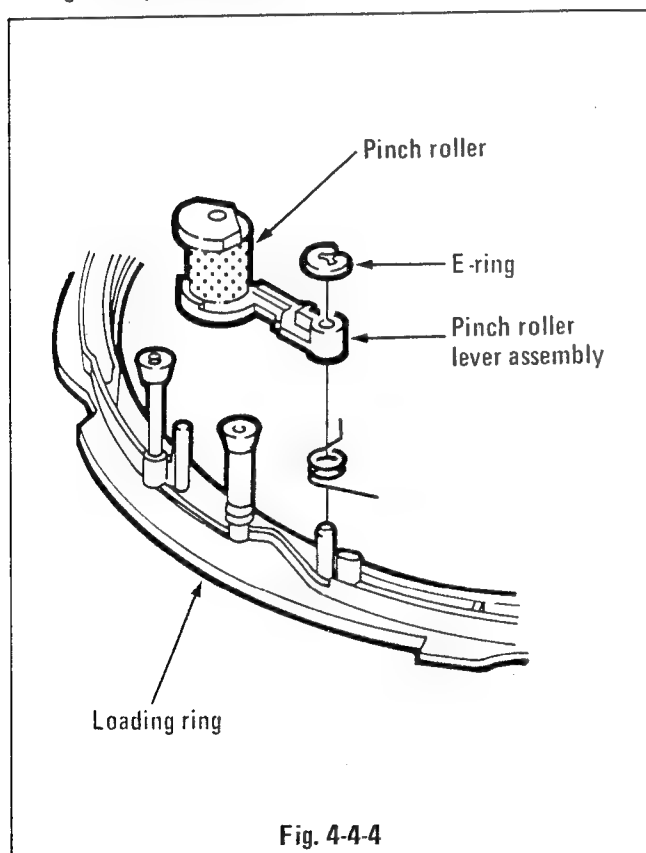


Fig. 4-4-2



3. PINCH ROLLER (See Fig. 4-4-4.)

- (1) Using a soft cloth moistened with alcohol, clean the surfaces of the pinch roller.
- (2) If there are scratches on the pinch roller, remove the E-ring and replace the pinch roller lever assembly.



4. TAPE PATH

Clean the surfaces of the tape guides and the drum tape path by using a soft cloth or cleaning stick moistened with an alcohol.

(Caution)

When cleaning the drum surfaces, be careful not to contact the video heads.

5. SUPPLY REEL BASE (See Fig. 4-4-5.)

- (1) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)
- (2) Remove the washers holding the supply reel base.
- (3) Turn the ratchet brake in the direction of arrow A.
- (4) While pressing the mode select slide in the direction of arrow B, remove the supply reel base and pulley.

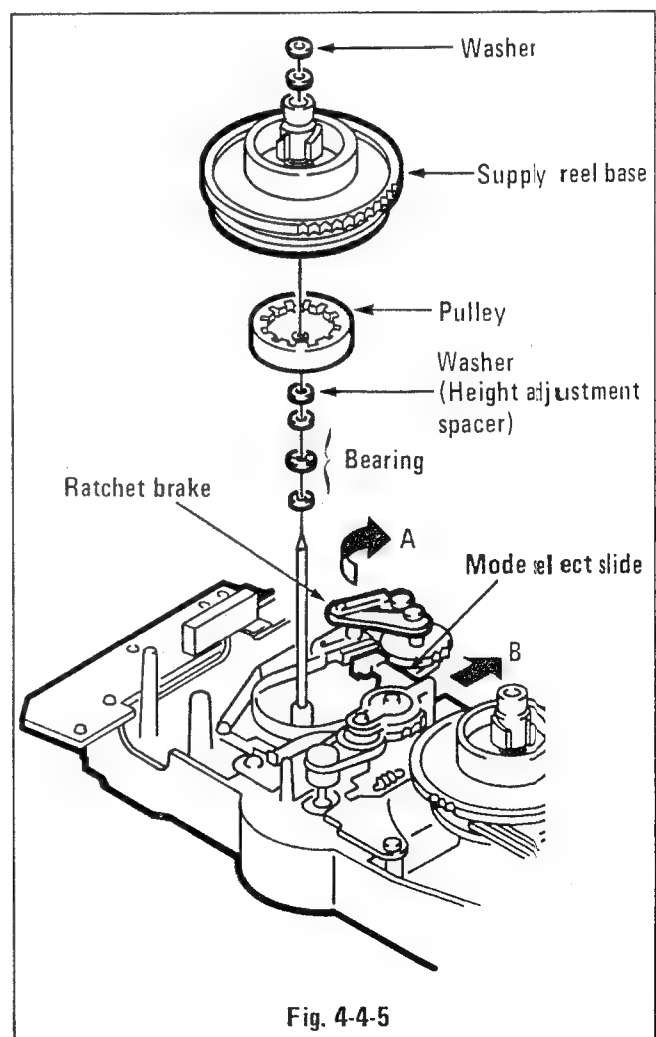
(Caution)

Be careful not to lose the height adjustment spacer.

- (5) Wipe off the old oil from the reel shaft by using a cloth moistened with alcohol, and then apply a small amount of new oil.

- (6) While pressing the mode select slide in the direction of arrow B, install the supply reel base, and pulley. If a new supply reel base is being installed, adjust the reel base height. (Refer to item 5. ADJUSTMENTS, 1. REEL BASE HEIGHT.)

- (7) Mount the washers, and then install the F.L. mechanism assembly.



6. TAKE-UP REEL BASE (See Fig. 4-4-6.)

(1) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)

(2) Remove the washers holding the take-up reel base.

(3) While pressing the mode select slide in the direction of arrow A and the take-up reel soft brake in the direction of arrow B, remove the take-up reel base.

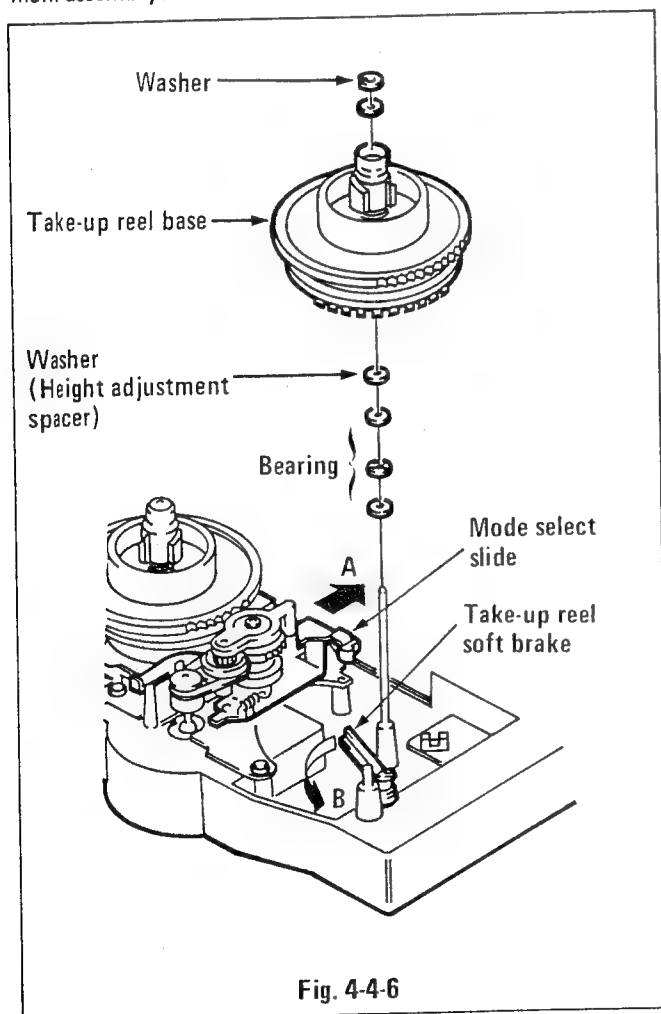
(Caution)

Be careful not to lose the height adjustment spacer.

(4) Wipe off the old oil from the reel shaft by using a cloth moistened with alcohol, and then apply a small amount of new oil.

(5) While pressing the mode select slide in the direction of arrow A and the take-up reel soft brake in the direction of arrow B, install the take-up reel base. If a new take-up reel base is being installed, adjust the reel base height. (Refer to item 5. ADJUSTMENTS, 1. REEL BASE HEIGHT.)

(6) Mount the washers, and then install the F.L. mechanism assembly.



7. REEL BASE DRIVE GEAR ASSEMBLY (See Fig. 4-4-7.)

(1) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)

(2) Remove the supply reel base. (Refer to item 5. SUPPLY REEL BASE.)

(3) Remove the take-up reel base. (Refer to item 5. TAKE-UP REEL BASE.)

(4) Remove the screw (a) which secures the ratchet brake, and then remove the brake.

(5) Remove the reel motor belt.

(6) Remove the screws (b) which secure the reel base drive gear assembly, and then remove the assembly.

(7) Remove the E-ring, and then remove the center gear and the F FWD/REW lever. Next, remove the washers, and then remove the PLAY gear and the F FWD/REW roller.

(8) Clean the support shaft of the F FWD/REW lever, center gear, and PLAY lever, and also the shaft of the F FWD/REW roller and PLAY gear by using a cloth moistened with alcohol, and then apply a small amount of new oil.

(9) Install the PLAY gear, the F FWD/REW roller, the PLAY lever, the center gear, and the F FWD/REW lever by reversing the removal procedure.

(10) Install the reel base drive gear assembly. The prong on the end of the mode select slide should fit into the hole in the mode select lever.

(11) Install the reel motor belt.

(Caution)

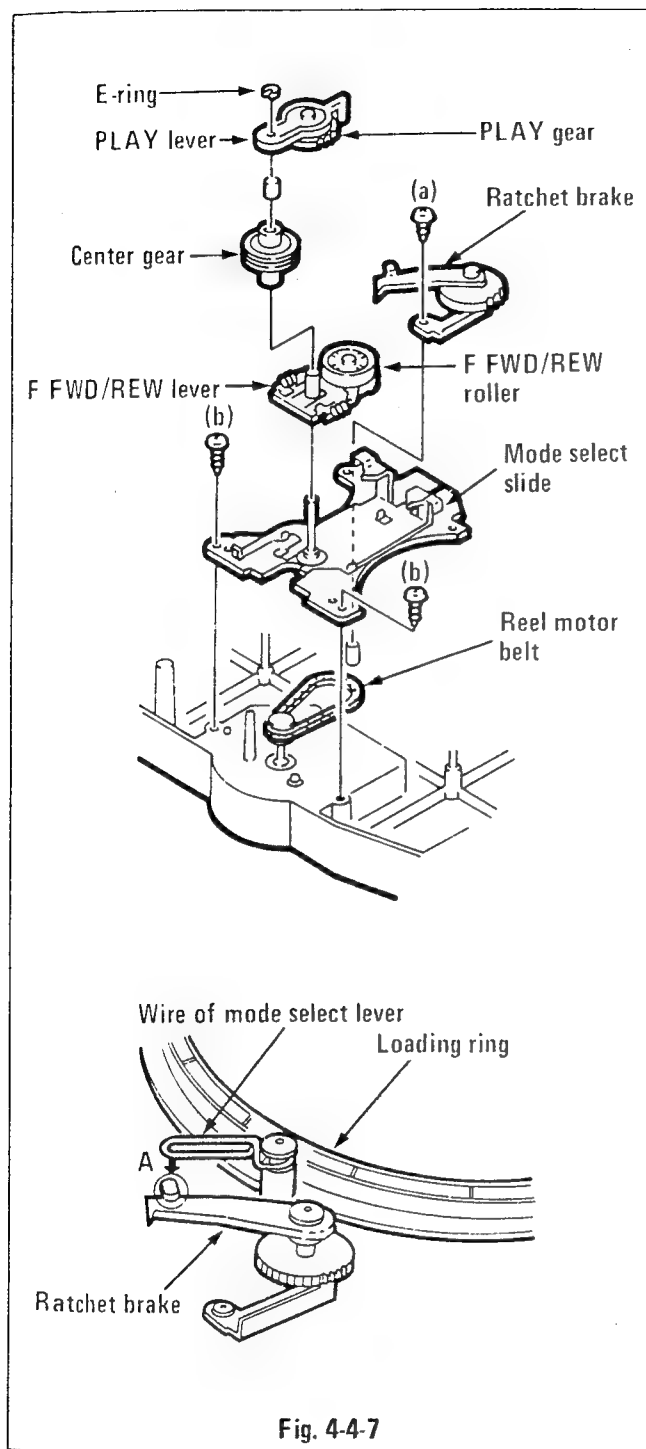
Be sure that the belt is not twisted, and be careful that oil does not get on the belt.

(12) Install the ratchet brake. Part A of the ratchet brake should be in contact with the wire of the mode select lever.

(13) Install the supply reel base, the take-up reel base, and the F.L. mechanism assembly.

(Caution)

The reel base drive gear assembly should be disassembled for cleaning and lubrication only.



8. BACK TENSION BRAKE BAND (See Fig. 4-4-8.)

(1) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)

(2) Remove the supply reel base. (Refer to item 5. SUPPLY REEL BASE.)

(3) Remove the reel base drive gear assembly. (Refer to item 7. REEL BASE DRIVE GEAR ASSEMBLY.)

(4) Disconnect the brake band lever from the back tension lever.

(5) Remove the screw (a) which holds the brake band bracket.

(6) Remove the back tension brake band by passing the brake band lever under the loading ring.

(7) Install the new brake band by reversing the removal procedure.

(Caution)

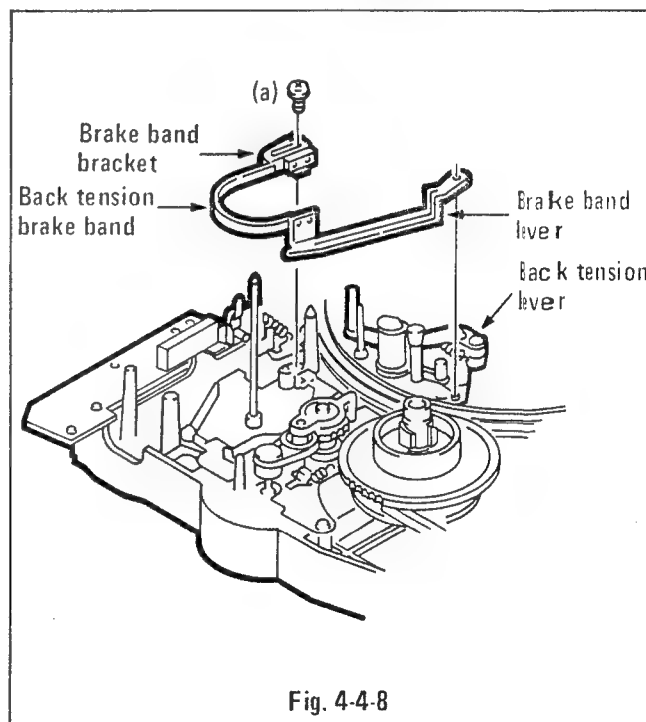
Be careful not to crease or scratch the new brake band.

(8) Install the reel base drive gear assembly.

(9) Install the supply reel base.

(10) Adjust the position of the back tension lever. (Refer to item 5. ADJUSTMENTS, 1. REEL BASE HEIGHT.)

(11) Install the F.L. mechanism assembly.



9. AUDIO/CONTROL HEAD ASSEMBLY (See Fig. 4-4-9.)

- (1) Remove the screws (a, b) which hold the audio/control head assembly, and then remove the soldered lead wire.
- (2) Install the new audio/control head assembly.

(Caution)

Be careful to solder the lead wire at the correct position.

- (3) Adjust the tape path. (Refer to item 6. TAPE PATH ADJUSTMENTS.)

(Note)

Play the alignment tape (VJ-0093) or a previously recorded tape; if the playback is normal, adjustment is not necessary.

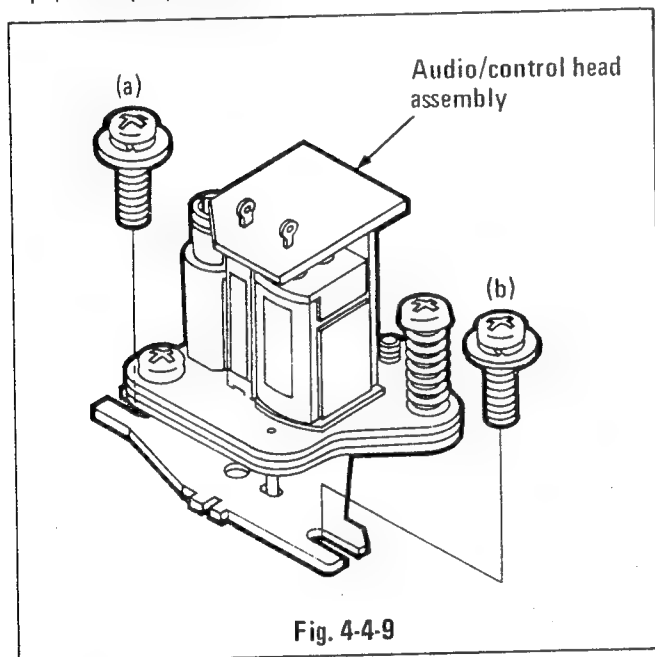


Fig. 4-4-9

10. FWD SENSOR (See Fig. 4-4-10.)

- (1) Remove the lead wire soldered to the FWD sensor.
- (2) While pressing part A of the FWD sensor in the direction of the arrow, remove the sensor by lifting it upward.
- (3) Install the new FWD sensor.
- (4) When doing the installation, fit the hole B of the FWD sensor onto the prong C of the bracket head, and press downward.

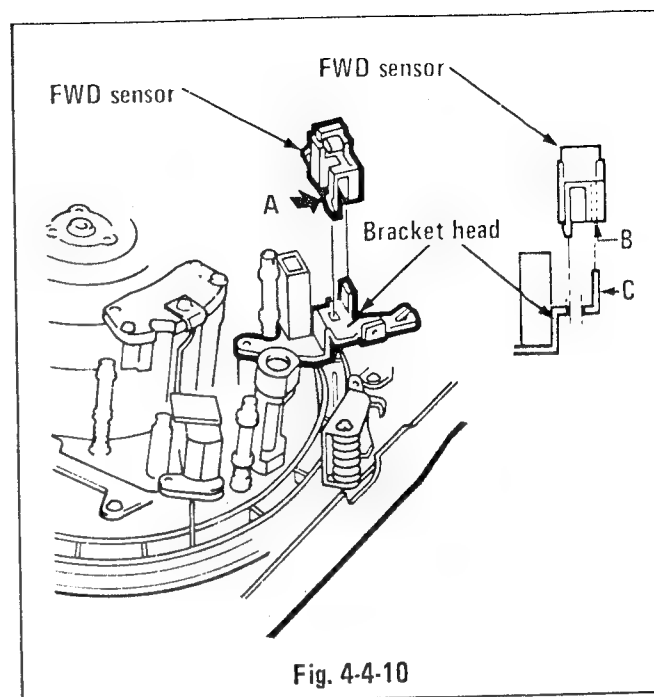


Fig. 4-4-10

11. REW SENSOR (See Fig. 4-4-11.)

- (1) Remove the lead wire soldered to the REW sensor.
- (2) Remove the screw (a), and then remove the REW sensor assembly.
- (3) Remove the fixer securing the flexible circuit board, and then, after removing the grip ring, remove the REW sensor.

(Caution)

Do not to fold or twist the flexible circuit board.

- (4) Install the new REW sensor by using the reverse order of the removal procedure.

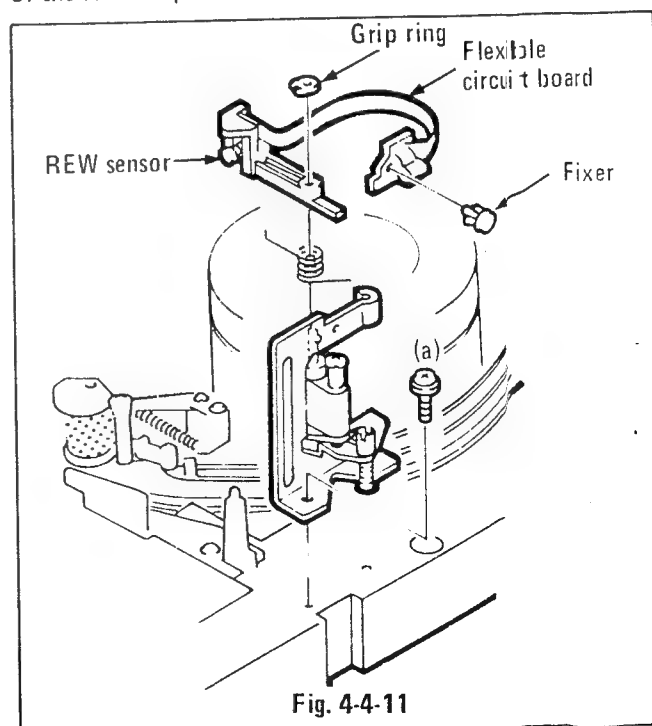


Fig. 4-4-11

12. CAPSTAN MOTOR (See Fig. 4-4-12.)

(1) Disconnect the capstan motor connector.

(Caution)

Be sure that the power is off [the power switch is in the OFF position] when connecting or disconnecting the connector.

(2) Remove the capstan motor bracket screws (a), and then remove the bracket.

(3) Remove the screws (b) securing the capstan motor, and then remove the motor.

(4) Install the new capstan motor by using the reverse order of the removal procedure.

(5) Adjust the tape path. (Refer to item 6. TAPE PATH ADJUSTMENTS.)

(Note)

Play the alignment tape (VJ-0093) or a previously recorded tape; if the playback is normal, adjustment is not necessary.

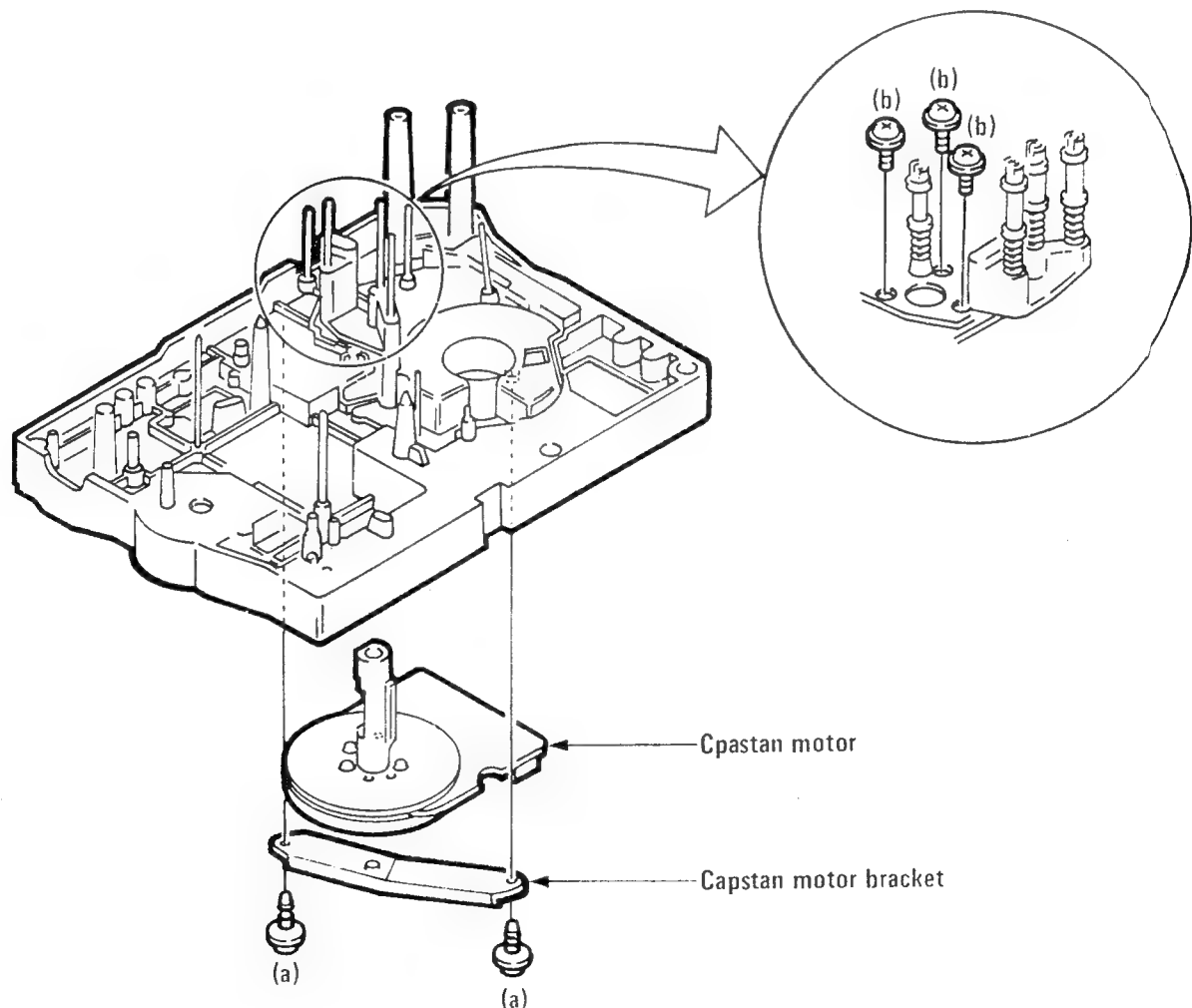


Fig. 4-4-12

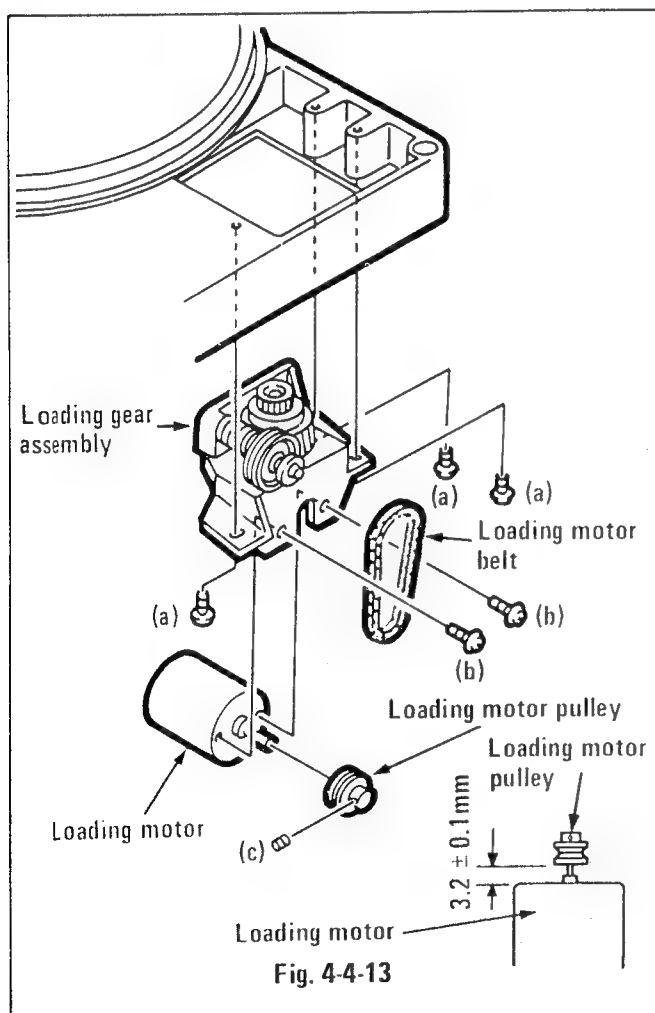
13. LOADING MOTOR (See Fig. 4-4-13.)

- (1) Remove the lead wire soldered to the loading motor.
- (2) Remove the loading motor bracket screws (a), and then remove the loading motor assembly.
- (3) Remove the loading belt.
- (4) Remove the screws (b) which secure the loading motor, and then remove the motor.
- (5) Loosen the set screw (c) which secures the loading motor pulley by using the hexagonal wrench (VJ-0108 ... M2.6), and then remove the pulley.
- (6) Mount the loading motor pulley to the new loading motor.

(Caution)

When mounting the loading motor pulley, be sure to adjust the height.

- (7) Install the loading motor by using the reverse order of the removal procedure.



14. LOADING RING (See Fig. 4-4-14.)

- (1) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)

- (2) Remove the supply reel base. (Refer to item 5. SUPPLY REEL BASE.)

- (3) Remove the ratchet brake.

- (4) Insert the curved tip A of the pressure spring attached to the pinch roller pressure lever into the hole B in the lever.

- (5) Cut the fixer securing the lead wire to the bracket head. Remove the solder from the E-head (full-erase head) terminal, and then remove the lead wire. Remove the screw securing the bracket head, and then remove the bracket head.

- (6) Remove the REW sensor assembly. (Refer to item 11. REW SENSOR.)

(Caution)

It is not necessary to remove the lead wire which is soldered to the REW sensor.

- (7) Disconnect the connectors, lead wires, etc.

* The video head lead wire connector (the connector which is connected to circuit board VD-1).

* The various lead wire connectors for the audio/control head, the full-erase head, etc.

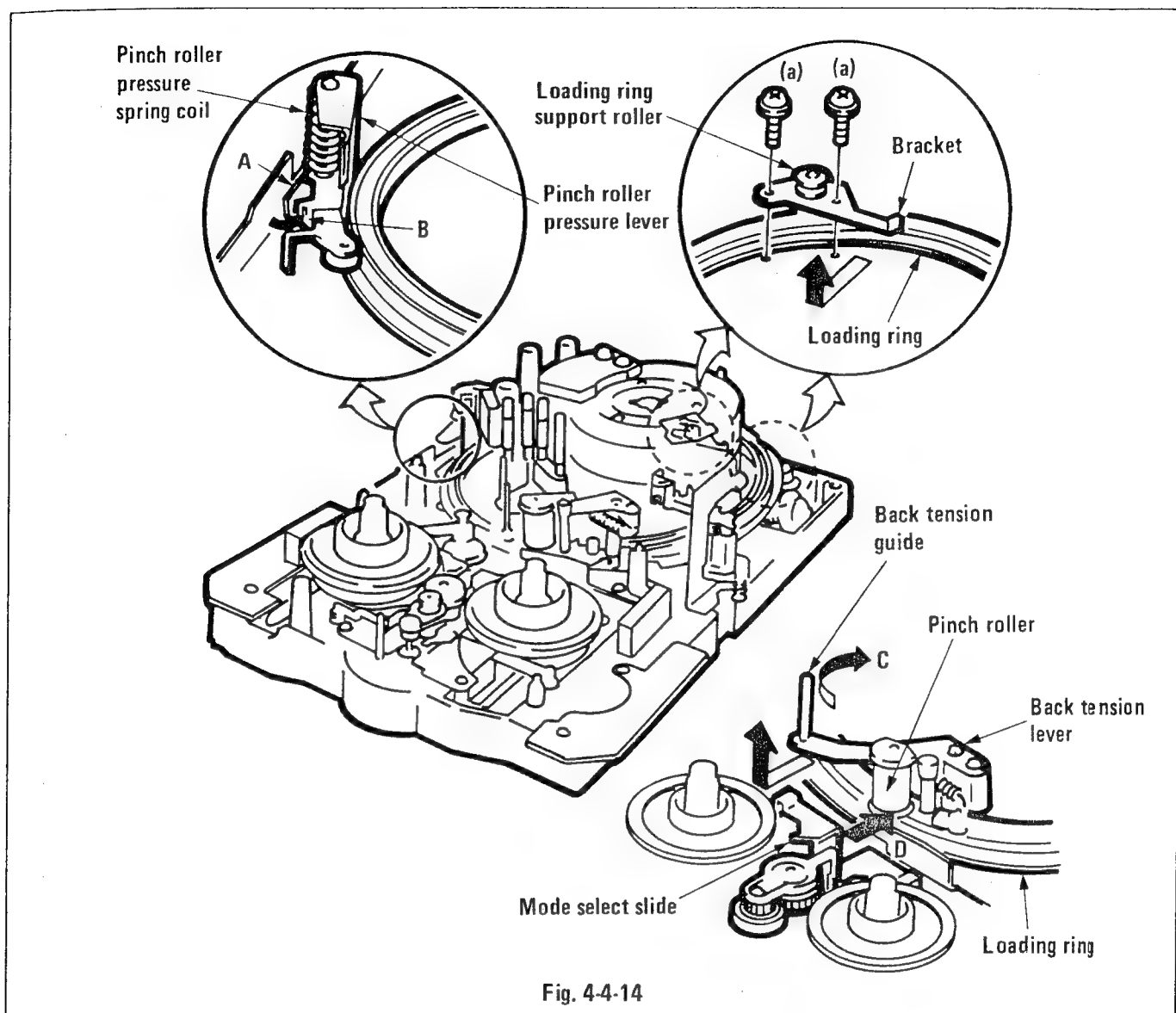
* The DEW sensor (Do not break the solder on the DEW sensor.)

- (8) Remove the bracket screws (a) of the loading ring support rollers, and then remove the bracket.

- (9) While pressing the back tension lever in the direction of arrow C and the mode select slide in the direction of arrow D, slide the loading ring upward and remove it.

(Caution)

When pressing the back tension lever, be careful not to press the back tension guide. In addition, be careful not to scratch the video head drum, the video heads, the audio/-control head, the back tension guide, etc., and do not touch the loading guide or the pinch roller.



[Loading ring installation] (See Figs. 4-4-15, 4-4-16)

(1) While pressing the back tension lever in the direction of arrow C and the mode select slide in the direction of arrow D, insert the loading ring, and fit it into the grooves of the two support rollers on the secured side.

(Caution)

When pressing the back tension lever, be careful not to press the back tension guide.

(2) Tighten the bracket screws (a) of the loading ring support rollers.

(Caution)

Be sure that the loading ring is set inside the grooves of the support rollers at all three places. Also, be sure that the loading gear and the loading ring gear are securely intermeshed.

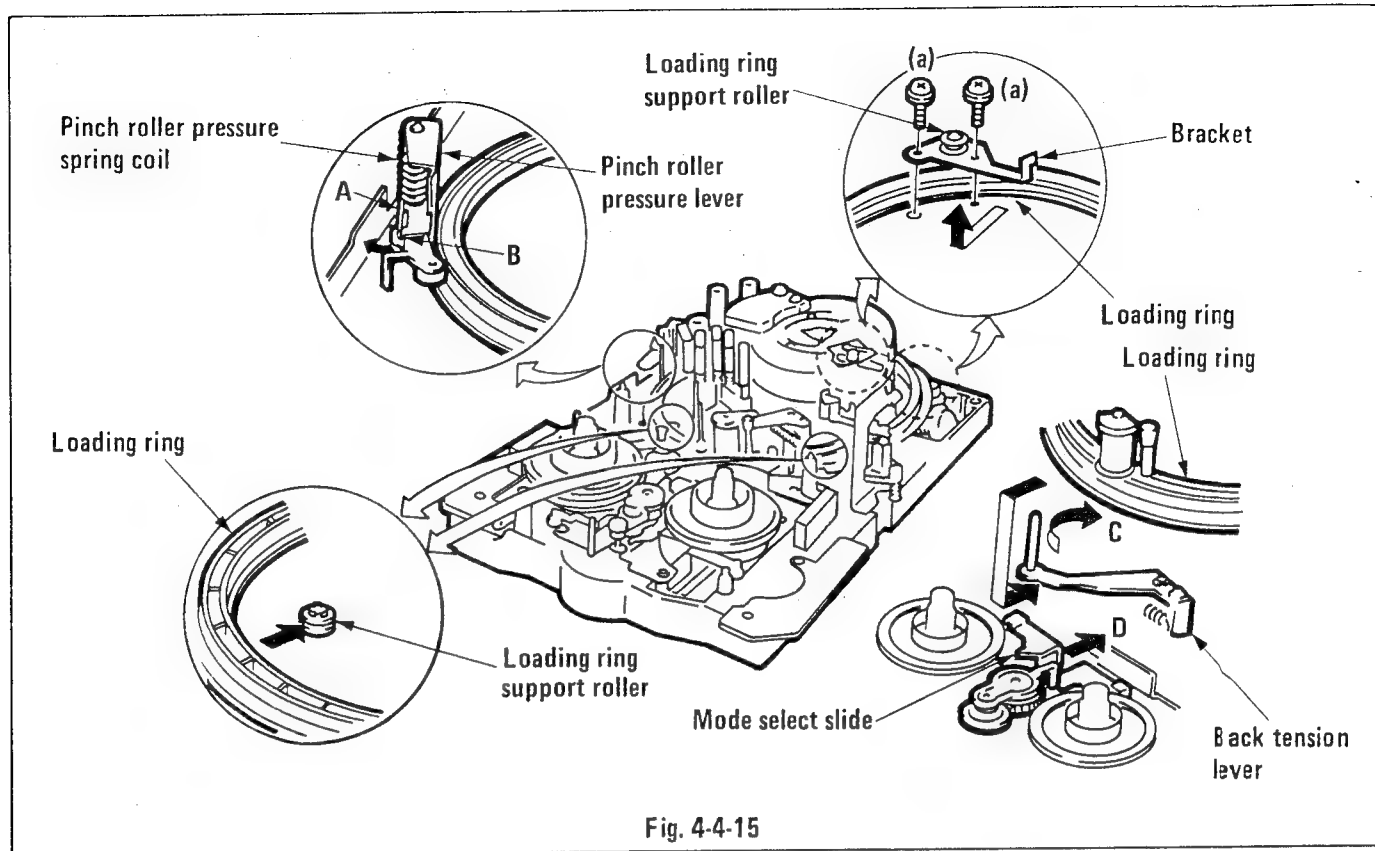
(3) Set the loading ring to the condition at the completion of loading.

* Install the bracket head.

* Pass the fixer through the hole in the bracket head, and then bunch and secure the lead wire. Be sure that the lead wire does not hang down, and be careful not to put too much pressure on the bracket head.

* Solder the lead wire to the full-erase head terminal.

(4) Remove the curved tip A of the pinch roller pressure spring from the hole B in the pinch roller pressure lever, and connect it to the wall of the main chassis.



(5) Install the ratchet brake and other parts by reversing the order of the removal procedure.

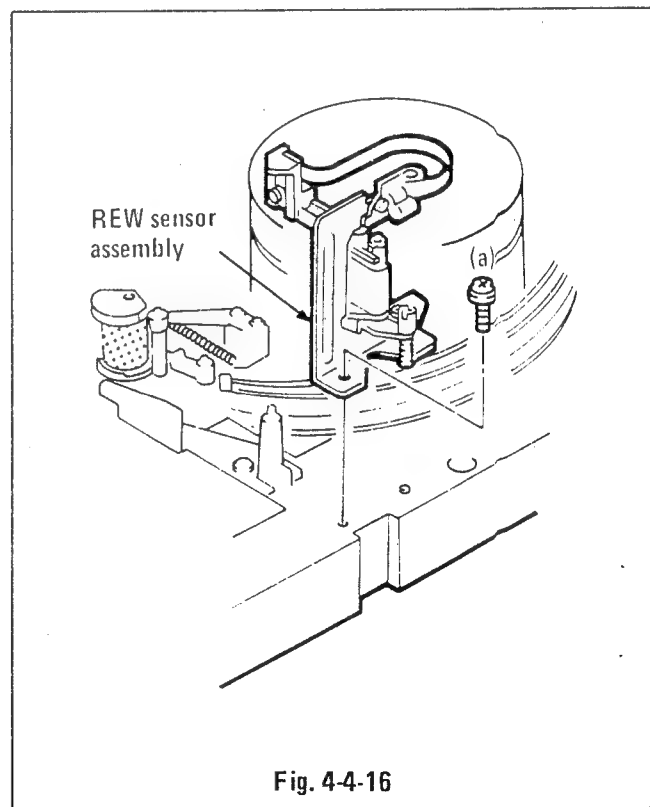
(Caution)

When the loading ring is in the condition of loading completion, install the REW sensor assembly as shown in Fig. 4-4-16.

(6) Play a previously recorded tape, and check that there is nothing wrong with the tape path.

(Caution)

When installing the loading ring, be careful not to scratch the video head drum, the video heads, the audio/control head, the back tension guide, etc.



15. REEL MOTOR (See Fig. 4-4-17.)

(1) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)

(2) Remove the lead wire which is soldered to the reel motor.

(3) Remove the reel motor belt.

(4) Remove the reel motor mounting screws (a), and then remove the motor.

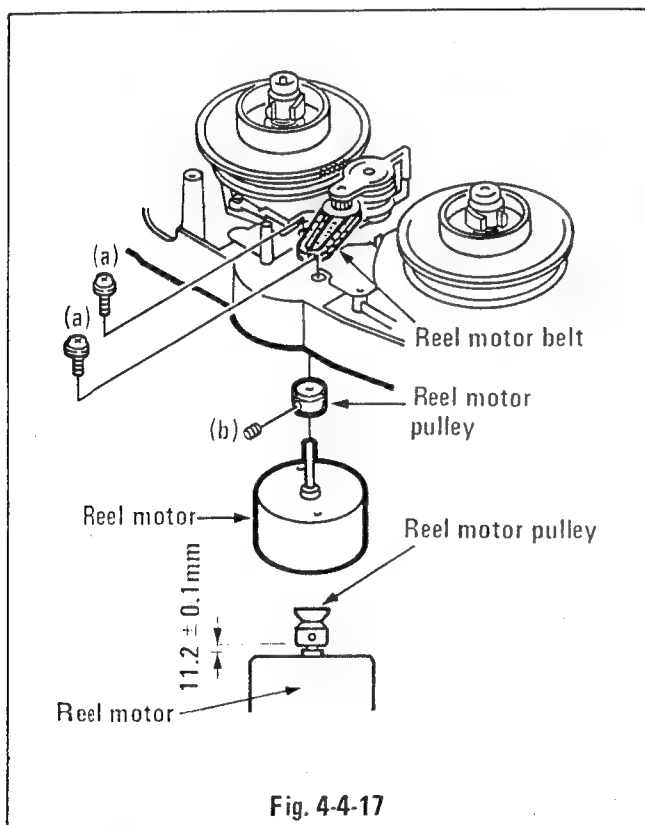
(5) Loosen the set screw (b) which secures the reel motor pulley by using the hexagonal wrench (VJ-0108 ... M2.6), and then remove the pulley.

(6) Mount the reel motor pulley onto the new motor.

(Caution)

When mounting the pulley, be sure to adjust the height.

(7) Install the reel motor by using the reverse order of the removal procedure.



16. VIDEO HEAD DISC (See Figs. 4-4-18, 4-4-19.)

(1) Break the solder connection of the PG lead wire (lead wire connected to the MC-4 circuit board in video head drum A).

(2) Remove the DEW sensor.

(Caution)

Do not break the solder connection on the DEW sensor, as its performance will be impaired if subjected to high temperatures for an extended period of time.

(3) Remove the screws (a), and, while lifting up video head drum A, loosen the M3 screw (b) with a Phillips screwdriver, and then remove video head drum A.

(4) Remove the screws (c) together with the rotary transformer brackets securing the rotary transformer.

(5) Break the solder connections of the rotary transformer lead wires (1), (2), (3), and (4), and then remove the transformer.

(Caution)

Make note of the solder connection locations for each of the rotary transformer lead wires. When removing the solder connections, do not leave the soldering iron on the video head terminals for more than five seconds. (See Fig. 4-4-19.)

(6) Remove the screws (d) which secure the video head disc, and then replace the disc.

(Caution)

Pay attention to the following points when replacing the video head disc:

- * Tighten each of the screws (d) with an equal amount of torque (6 kg-cm). Do not overtighten them.

- * Do not remove the spacer underneath the video head disc. Install the new video head disc right on to the old spacer. (It is possible that there is no spacer.)

- * Solder the lead wires in their original positions, and position them so that they follow along the video head disc and do not come in contact with drum A.

(7) Assemble the remaining parts in the reverse order of removal.

(Caution)

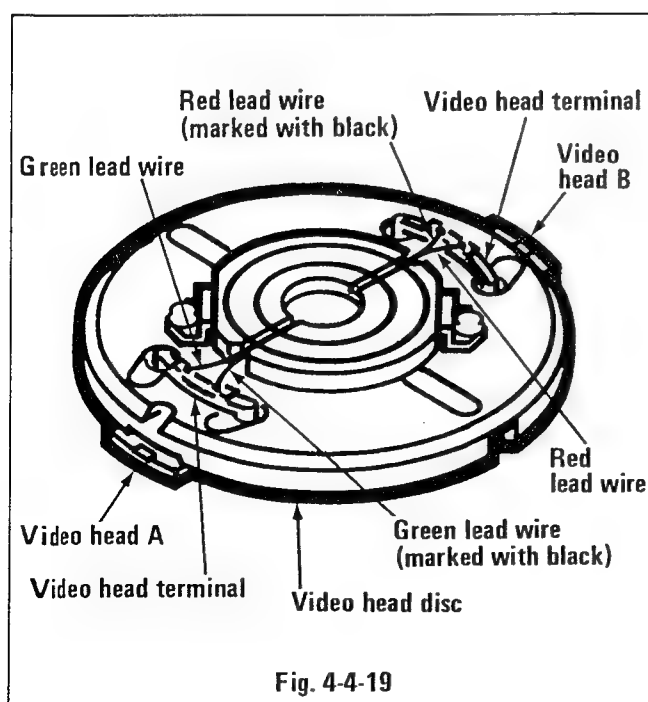
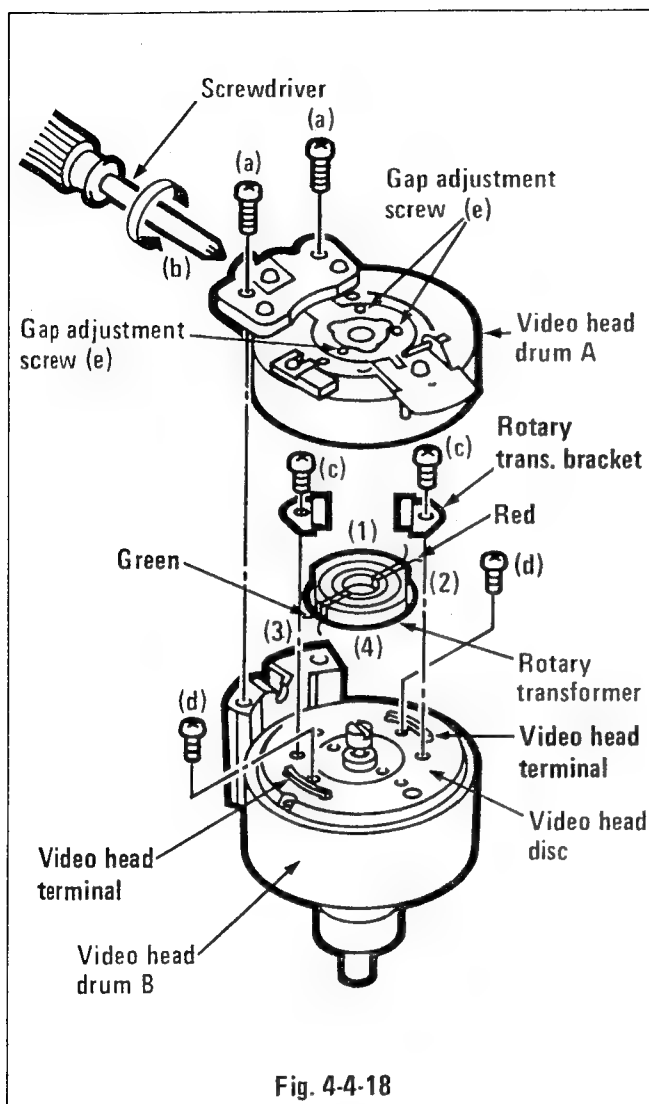
The M3 screw (b) determines the position of drum A, and so tighten it with a torque of 1 kg or less.

(8) Play the alignment tape (VJ-0093) or a previously recorded tape, and if there are any abnormalities in the picture, adjust the tracking. If a normal picture still cannot be obtained, adjust the tape path. (Refer to item 6. TAPE PATH ADJUSTMENTS.)

(9) If a slipping noise is heard from the video head drum when the tape is played back, it is probably because the video head drum is not installed properly; loosen the screws (a) and the M3 screw (b) again and adjust drum A.

(Caution)

If the slipping noise is heard after the adjustment is made, it indicates that the cause is a different thickness of the video head disc: turn the gap adjusting screws (e) $30^\circ - 40^\circ$ counter clockwise from the point at which the slipping noise is heard. (Tighten the gap adjusting screws (e) uniformly.)



17. SLIP ROLLER ASSEMBLY AND BELT (See Fig. 4-4-20)

(1) Remove the F.L. mechanism assembly.(Refer to item 2. PREPARATIONS FOR ADJUSTMENT)

(2) Rotate the slip roller assembly clockwise, and slightly move the cassette holder from the completed cassette eject position.

(3) Remove the screw (a) holding the worm cap, and then remove the worm cap, the belt, the 2.5mm ϕ washers 2, the slip roller assembly, and the 3.0mm ϕ washers 2.

(Caution)

If the worm cap is removed in the completed cassette eject position, the slip roller assembly will fly off.

(4) Clean the shaft of the slip roller assembly with a cloth moistened with alcohol and then apply new (SUN X-5) grease.

(5) Replace the 3.0mm ϕ washers, the slip roller assembly, the 2.5mm ϕ washers, the belt, and the worm cap in the reverse order of disassembly.

(Caution)

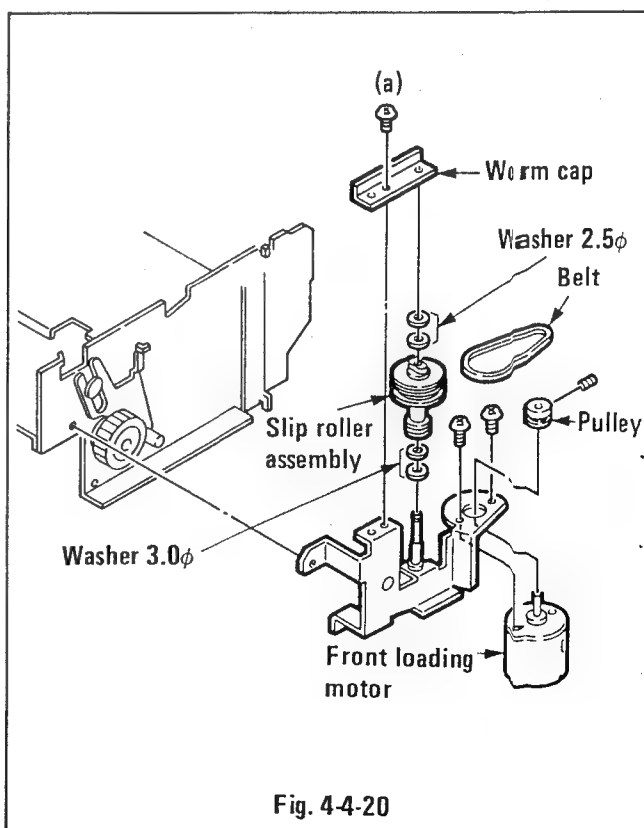
* Do not mistake the order of the washers.

* Use only the specified grease on the washers.

Molycaost grease, in particular, will cause problems if it comes in contact with the worm spindle gear, so do not use it.

* Be careful not to twist or get oil or grease on the belt.

(6) Rotate the slip roller assembly counter clockwise, and move the cassette holder to the completed cassette eject position.

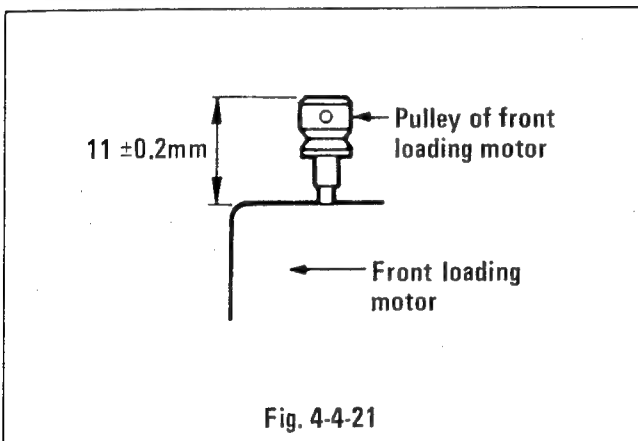


18. FRONT LOADING MOTOR (See Fig. 4-4-21)

- (1) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)
- (2) Remove the belt, and then by using the hexagonal wrench (VJ-0108 ... M2.6) remove the allen screw holding the front loading motor pulley.
- (3) Remove the 2 screws (b) holding the front loading motor, and remove the front loading motor.
- (4) Mount the new front loading motor in the reverse order of removal.

(Caution)

When mounting the front loading motor pulley, adjust it to the height shown in Fig. 4-4-21.

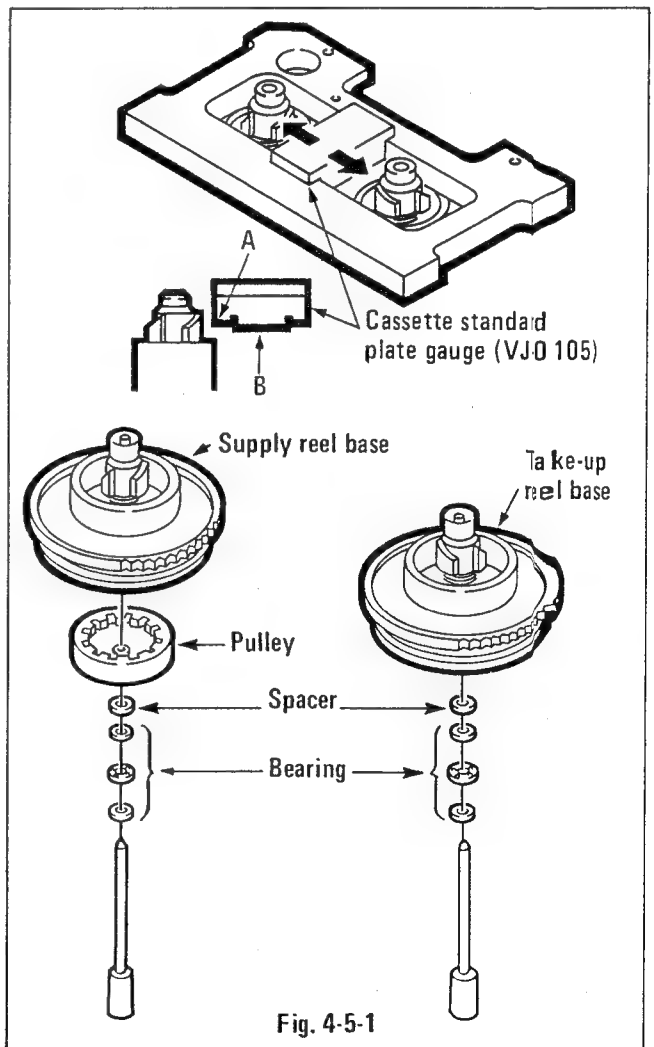


5. ADJUSTMENTS

1. REEL BASE HEIGHT (See Fig. 4-5-1.)

If the reel base height is not correct, the tape inside the cassette will be unevenly wound. When this tape is used again, the unevenly wound tape will cause the tape tension to fluctuate, and correct tape path will be impossible to obtain.

- (1) Turn off the power. [Set the power switch to the OFF position.]
- (2) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)
- (3) Insert the standard cassette plate (VJ-0105) and slide the gauge in the direction of the arrows.
- (4) Confirm that, when the gauge stops, the reel bases are not in contact with surface A of the plate and are in contact with surface B.
- (5) If the reel base is in contact with surface A, remove a spacer and check again.



(6) If the reel base is not in contact with surface B, add a spacer and check again.

(Note)

Adjust the reel base height by adding or removing spacers (0.13T, 0.25T, 0.5T) as appropriate so that the height meets the specifications. Use the same method for both the take-up reel base and the supply reel base.

2. BACK TENSION LEVER POSITION (See Fig. 4-5-2.)

The back tension must be applied uniformly to the tape so that the tape can travel smoothly with relation to the various heads and the guides. If the back tension is too strong, it will cause the tape to stretch, and if it is too weak, the tape will separate from the heads and tape guides.

(1) Turn off the power. [Set the power switch to the OFF position.]

(2) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)

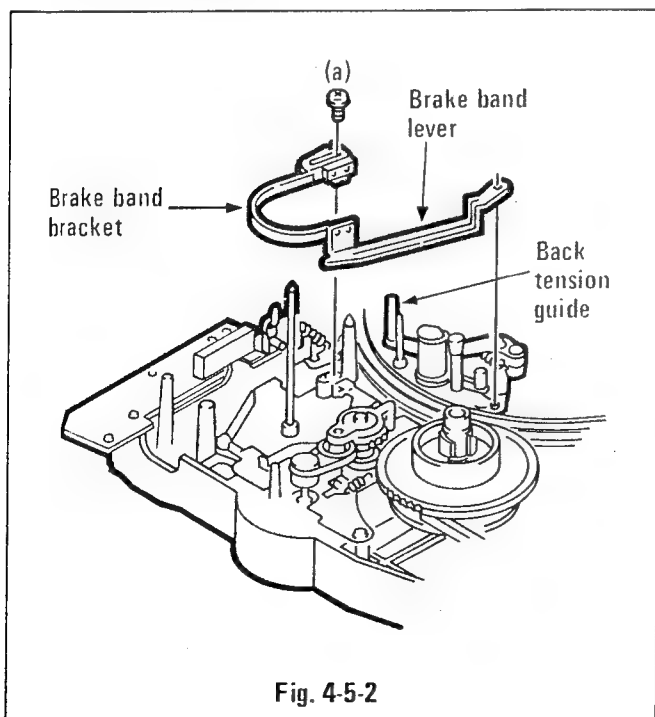
(3) Manually operate the loading ring to reach the condition of loading completion.

(4) Insert the back tension adjustment gauge (VJ-0120) and check the position of the back tension guide.

(5) If the position of the back tension guide is not correct, loosen the screw (a), move the brake band bracket, and adjust the position of the back tension guide.

(6) Tighten the screw (a) to secure the position of the brake band bracket.

(7) Move the loading ring to the condition of unloading completion, and install the F.L. mechanism assembly.



3. WINDING TORQUE (See Figs. 4-5-3 ~ 4-5-6.)

In the various modes of the VCR, the tape which leaves the supply (or take-up) reel is wound around the take-up (or supply) reel. If the winding torque is too weak, the tape will not be wound properly and will become slack. On the other hand, if the winding torque is too strong, an excessive amount of tension will be applied to the tape and cause the tape to stretch.

[FWD Winding (Recording, Playback, Forward Search Torque)] (See Fig. 4-5-3.)

(1) Turn off the power. [Set the power switch to the OFF position.]

(2) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)

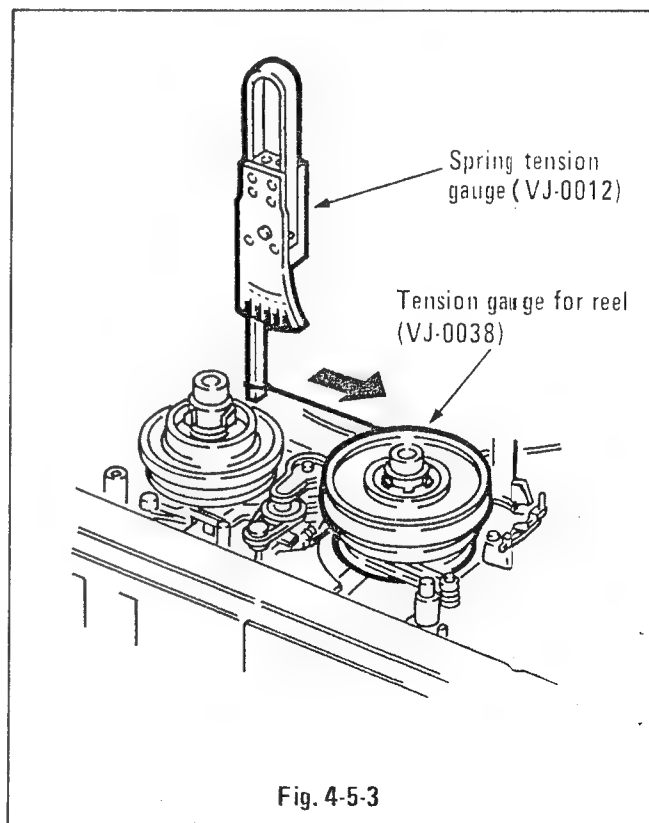
(3) Turn on the power. [Set the power switch to the ON position.]

(4) Mount the reel tension gauge (VJ-0038) on the take-up reel base, and then connect the string to the end of the spring tension gauge (VJ-0012).

(5) Press the PLAY button and measure the torque. The winding torque should be between 30 g and 53 g.

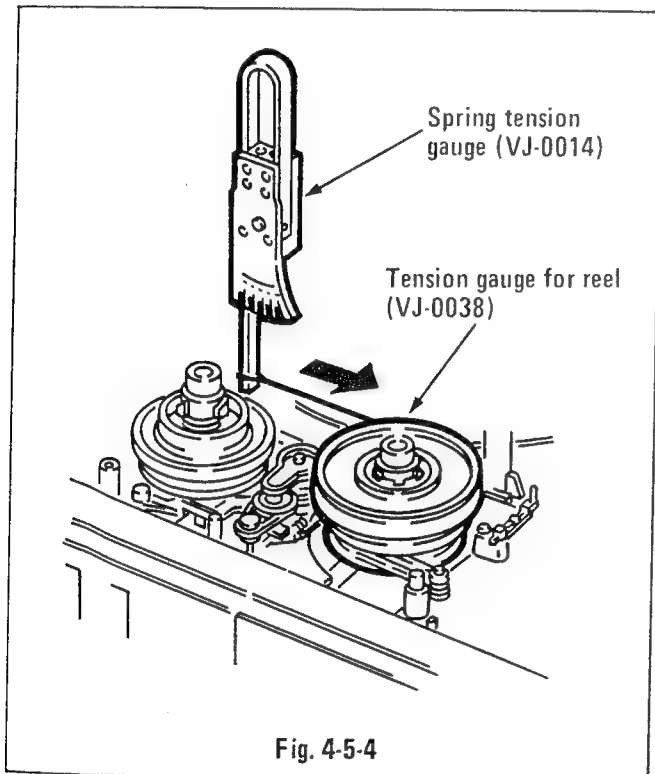
(6) If the measured value is not within the specified value range, replace the take-up reel base.

(7) Install the F.L. mechanism assembly.



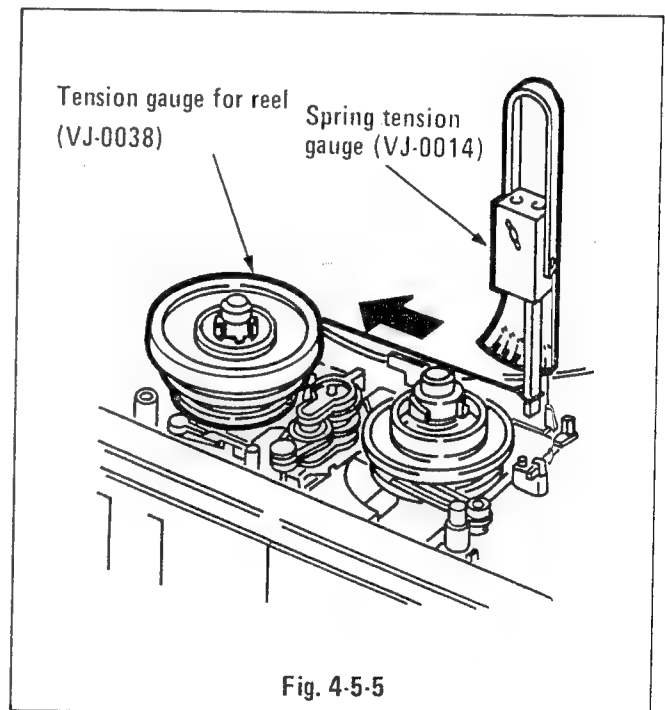
[F FWD Winding Torque] (See Fig. 4-5-4.)

- (1) Turn off the power. [Set the power switch to the OFF position]
- (2) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)
- (3) Turn on the power. [Set the power switch to the ON position.]
- (4) Mount the reel tension gauge (VJ-0038) on the take-up reel, and then connect the string to the end of the spring tension gauge (VJ-0014).
- (5) Press the F FWD button, and measure the torque. The winding torque should be 165 g or more.
- (6) If the measured value is less than the specified value, check for a problem with the reel motor belt, and replace the belt if necessary.
- (7) Install the F.L. mechanism assembly.



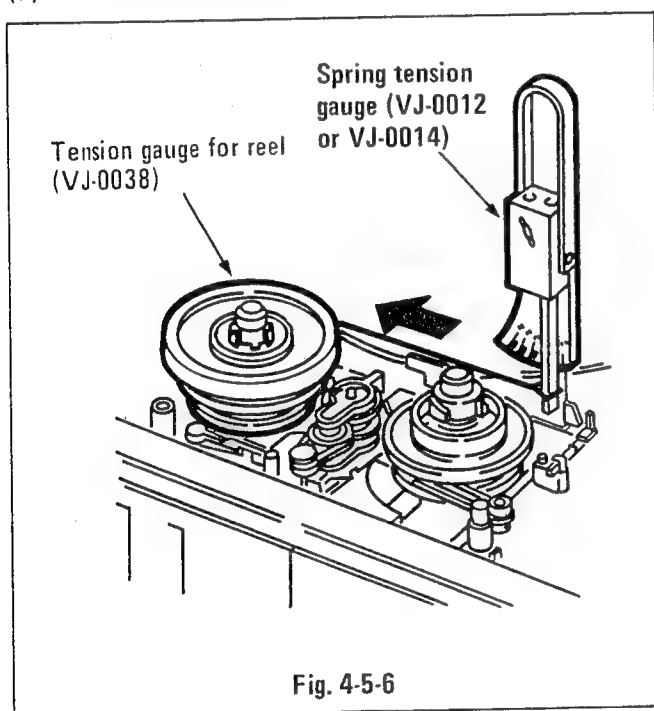
[REW Winding Torque] (See Fig. 4-5-5.)

- (1) Turn off the power. [Set the power switch to the OFF position.]
- (2) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)
- (3) Turn on the power. [Set the power switch to the ON position.]
- (4) Mount the reel tension gauge (VJ-0038) on the supply reel, and then connect the string to the tip of the spring tension gauge (VJ-0014).
- (5) Press the REW button, and measure the torque. The winding torque should be 165 g or more.
- (6) If the measured value is less than the specified value, check for a problem with the reel motor belt, and replace the belt if necessary.
- (7) Install the F.L. mechanism assembly.



[R-SEARCH Winding Torque] (See Fig. 4-5-6.)

- (1) Turn off the power. [Set the power switch to the OFF position.]
- (2) Remove the F.L. mechanism assembly. (Refer to item 2. PREPARATIONS FOR ADJUSTMENT.)
- (3) Turn on the power. [Set the power switch to the ON position.]
- (4) Mount the reel tension gauge (VJ-0038) on the supply reel, and then connect the string to the end of the spring tension gauge (VJ-0012 or VJ-0014).
- (5) Press the R-SEARCH button, and measure the torque. The winding torque should be between 65 g and 120 g.
- (6) If the measured value is not within the specified value range, replace the supply reel base.
- (7) Install the F.L. mechanism assembly.



6. TAPE PATH ADJUSTMENTS

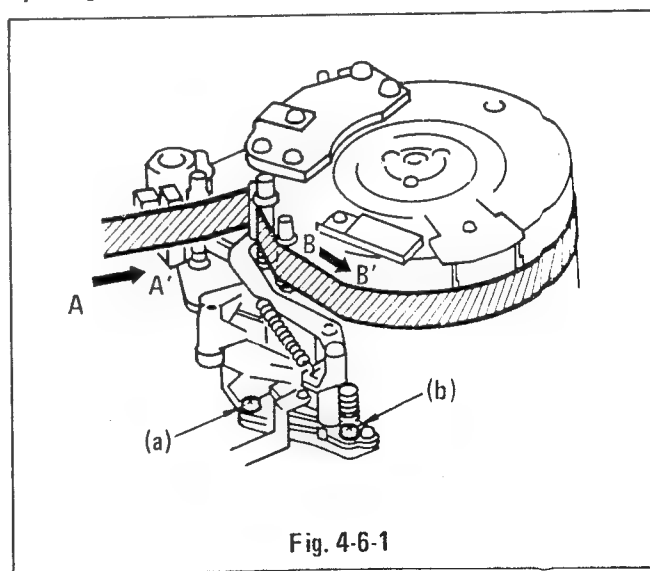
Each of the heads and tape guides has been adjusted to the precisely correct position and height. These parts have a very strong influence on tape path, and should normally not be touched. If the video head drum, the full-erase head, the audio/control head, etc., have been replaced, playback the alignment tape (VJ-0093) or a previously recorded tape, and check the image. Only if there are problems with the image that cannot be corrected by adjusting the tracking control should tape path adjustments be made. Also note that tape path adjustments should be made without removing the F.L. mechanism assembly (only remove the top board B).

1. BACK TENSION GUIDE VERTICAL POSITION (See Fig. 4-6-1.)

- (1) Play a tape on which the edges are not stretched, and check that there is no looseness in both the upper and lower edges of the tape in the area of the back tension guide.
- (2) If there is any looseness, adjust the screws (a), (b) so that the tension is applied evenly to the tape.

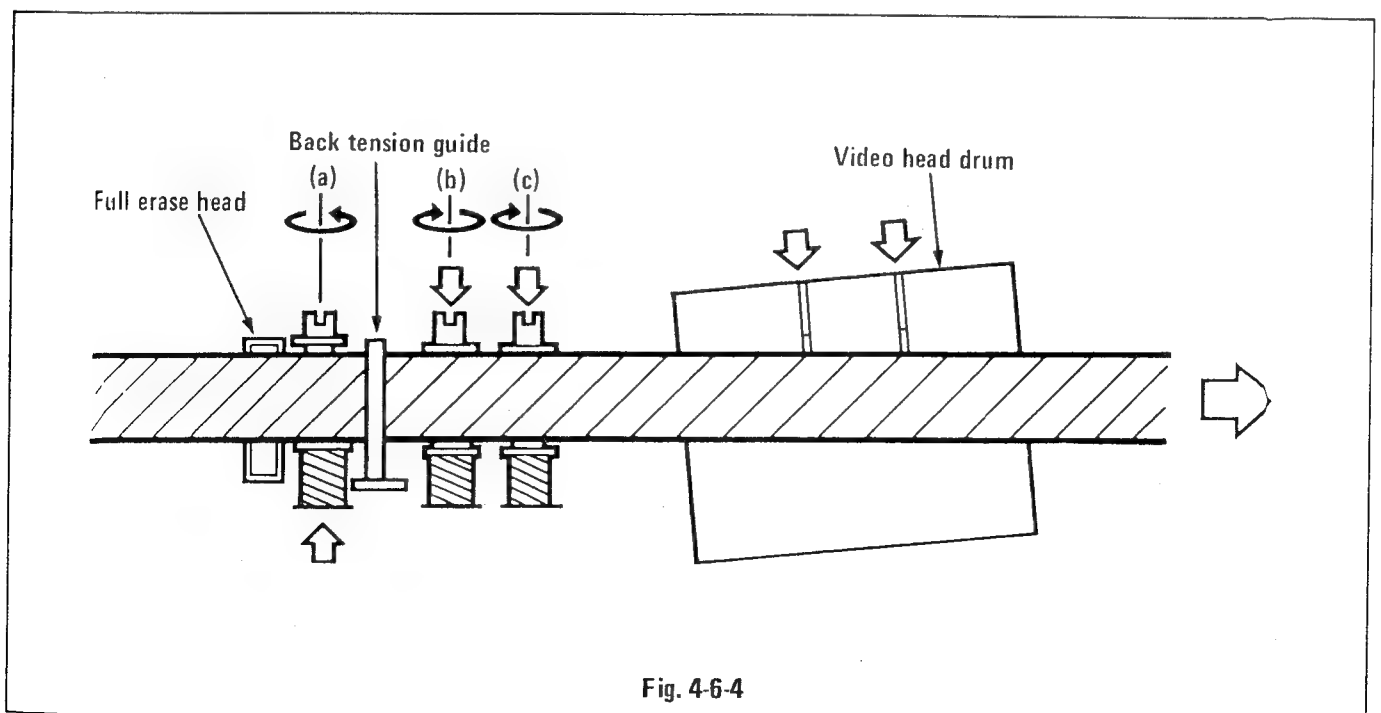
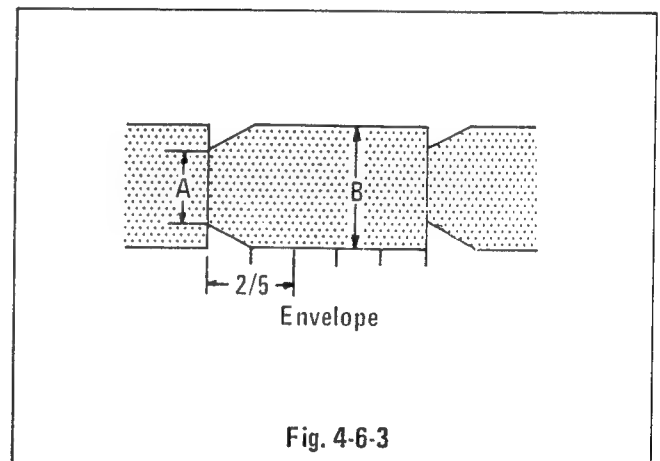
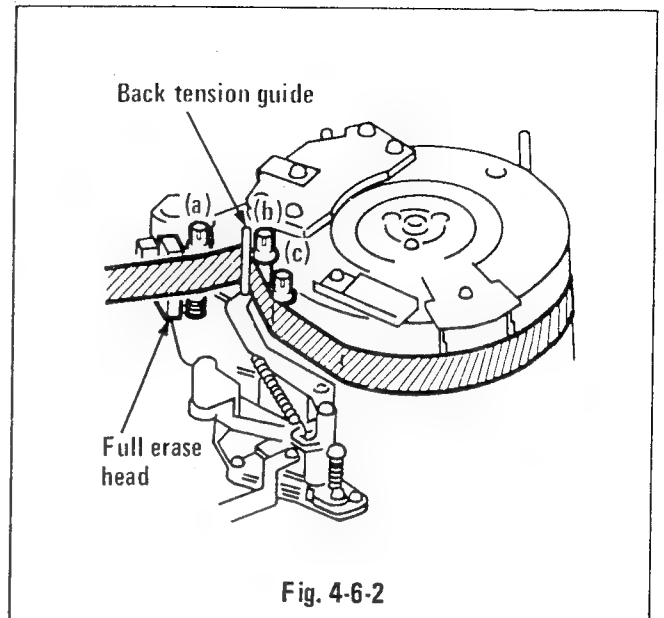
(Note)

Adjustment for the tape entering the back tension guide (direction A → A') is made by using screw (a), and that for the tape leaving the back tension guide (direction B → B') by using screw (b).



2. FULL-ERASE HEAD TAPE GUIDES (See Figs. 4-6-2 ~ 4-6-4.)

- (1) Connect an oscilloscope to the video output terminal (the check terminal of circuit board VD-1), and then playback the alignment tape (VJ-0093).
- (2) Check the tape path in the area of the back tension guide. If there is any looseness in either the upper or lower edges of the tape, adjust tape guides (a), (b), and (c) so that the guide flanges are not in contact. (See Fig. 4-6-2.)
- (3) While checking the waveform (envelope), adjust tape guide (a) so that the lower flange of the guide supports the lower edge of the tape. Next, adjust so that the size of amplitude A of the waveform is approximately -6dB ($1/2$ the size) in relation to the size of amplitude B of the waveform at a position approximately $2/5$ from the head switching point. (See Fig. 4-6-3.)
- (4) While checking with the inspection mirror (VJ-0015), adjust tape guides (b) and (c) so that the upper flanges of the guides do not cause any creases in the tape, lowering both guide (b) and guide (c) equally in order to maximize the size of amplitude A. (See Fig. 4-6-4.)



3. AUDIO/CONTROL HEAD TAPE GUIDES (See Figs. 4-6-5, 4-6-6.)

(1) Connect an oscilloscope to the video output terminal (the check terminal of circuit board VD-1), and playback the alignment tape (VJ-0093).

(2) Check the tape path in the area of the audio/control head. If there is any looseness in either the upper or lower edges of the tape, adjust tape guides (a) and (b) so that the guide flanges are not in contact. (See Fig. 4-6-5.)

(3) While checking the waveform (envelope), adjust tape guide (b) so that the upper flange of the guide supports the upper edge of the tape. Next, adjust so that the size of amplitude A of the waveform is approximately $-3\text{dB} \sim -6\text{dB}$ ($2/3 \sim 1/2$ the size) in relation to the size of amplitude B of the waveform at a position approximately $2/5$ from the head switching point. (See Fig. 4-6-6.)

(4) While checking with the inspection mirror (VJ-0015), adjust tape guide (a) so that the upper flange of the guide does not cause any creases in the tape, lowering guide (a) so that the size of amplitude A is maximized. (See Fig. 4-6-7.)

(5) If either the upper or lower edge of the tape is not in contact with the audio/control head and the tape guides and there is an unbalance between the top and the bottom, it is probably caused by the audio/control head slanting either forward or backward. (Refer to item 4. AUDIO/CONTROL HEAD).

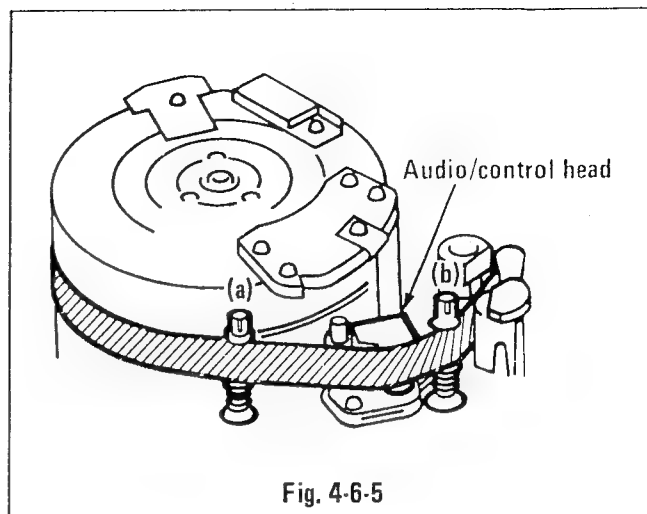
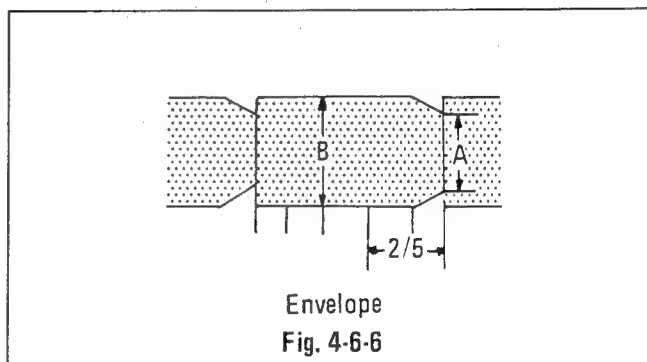


Fig. 4-6-5



Envelope
Fig. 4-6-6

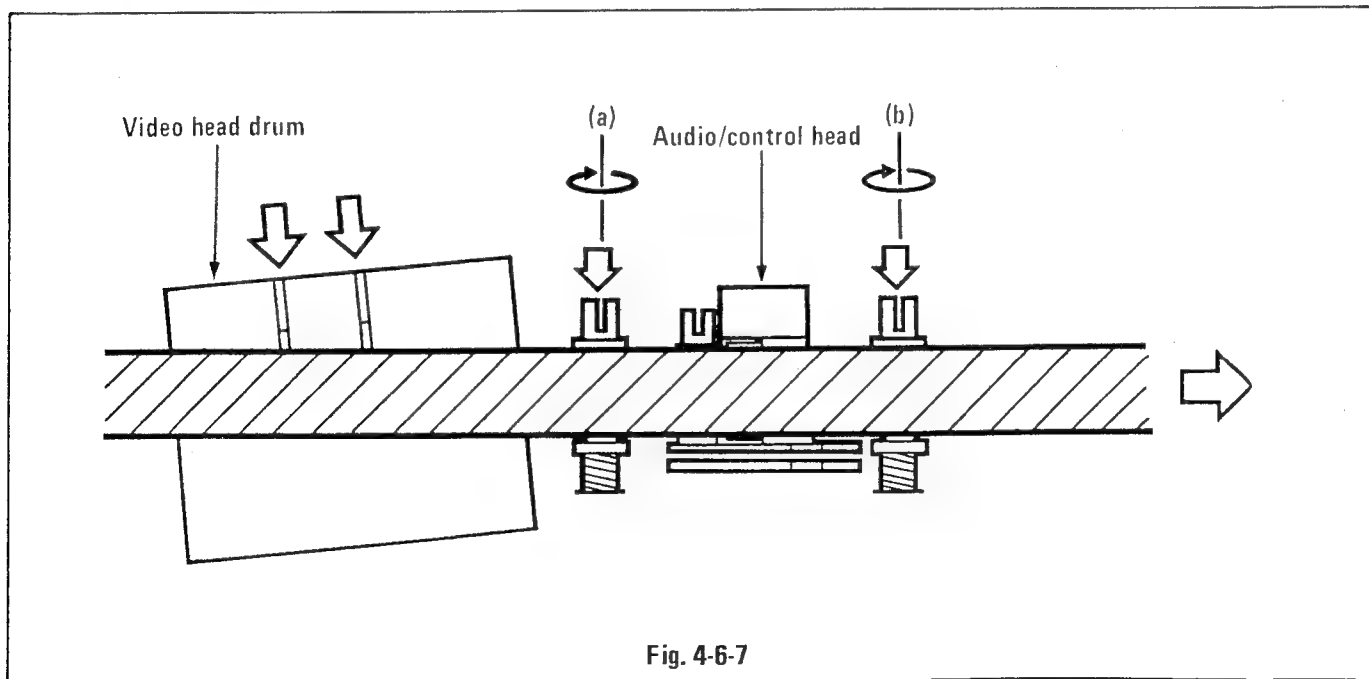


Fig. 4-6-7

4. AUDIO/CONTROL HEAD (See Fig. 4-6-8.)

Connect an oscilloscope to the audio output terminal (back side terminal part of set), and then playback the alignment tape (VJ-0093).

[Slanting Forward or Backward]

Check the tape path. If either the upper or lower edge of the tape is not in contact with the audio/control head and the tape guides, and there is an unbalance between the top and the bottom, adjust the allen screw (a) by using the hexagonal wrench (VJ-0022). When the allen screw (a) is turned to the right (clockwise), the audio/control head will slant forward, and when the allen screw (a) is turned to the left (counter clockwise), the audio/control head will slant backward.

[Head Height]

Adjust nut (b) with a flat-tipped screwdriver so that the audio output is maximized.

[Azimuth (Head Left-Right Angle)]

Adjust screw (c) with a Phillips (cross-tipped) screwdriver so that the audio output is maximized.

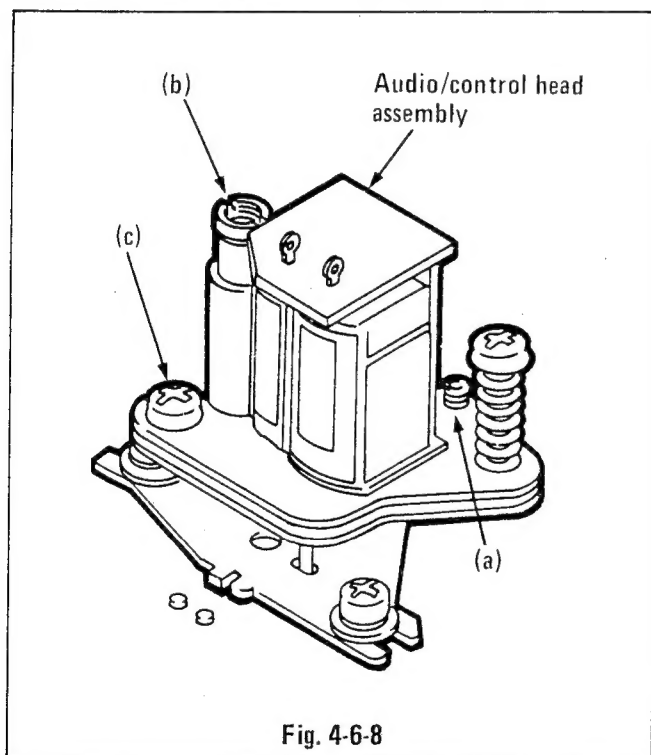


Fig. 4-6-8

5. TRACKING (See Fig. 4-6-9.)

(1) Connect an oscilloscope to the video output terminal (the check terminal of circuit board VD-1), and playback the alignment tape (VJ-0093).

(2) Loosen screws (a) and (b) approximately a 45° turn only, insert a flat-tipped screwdriver into the notch (c), and turn left and right to adjust so that the waveform (envelope) observed on the oscilloscope is maximized.

(Caution)

If screws (a) and (b) are loosened too much and the adjustment is made, the proper adjustment might be lost when the screws are retightened.

(3) After making the adjustment, retighten screws (a) and (b).

(4) Next, playback a tape which was previously recorded in the β III mode, and confirm that the envelope is maximized when the tracking control is at the center position.

(Caution)

If the envelope appears to be minimized when the tracking control is at the center position, readjust the tracking control and set it to a different envelope maximum point.

(5) Turn the tracking control to the right and left so that the waveform (envelope) which appears on the oscilloscope changes fairly evenly.

(6) Record and playback a television broadcast, and confirm that there are no problems with the image on the screen.

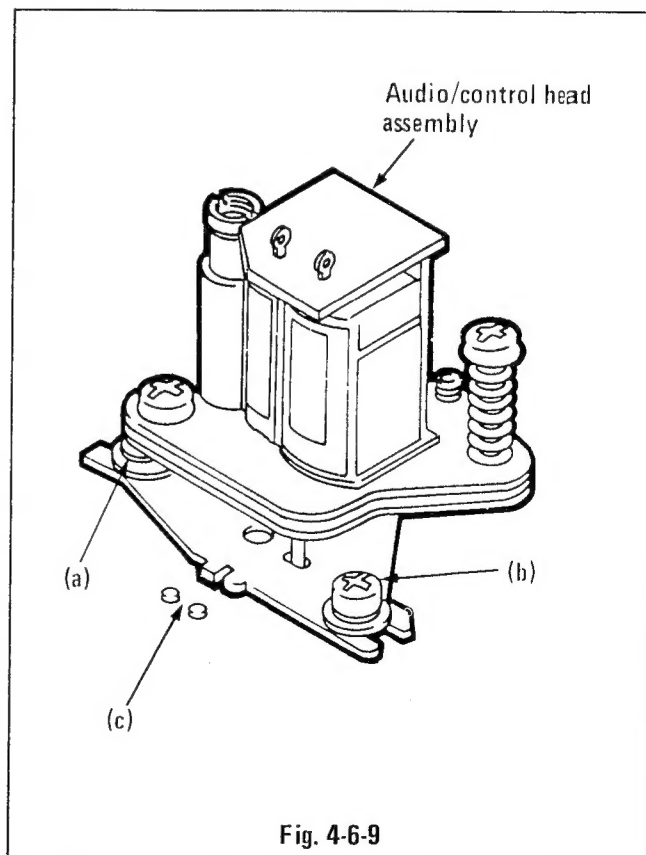
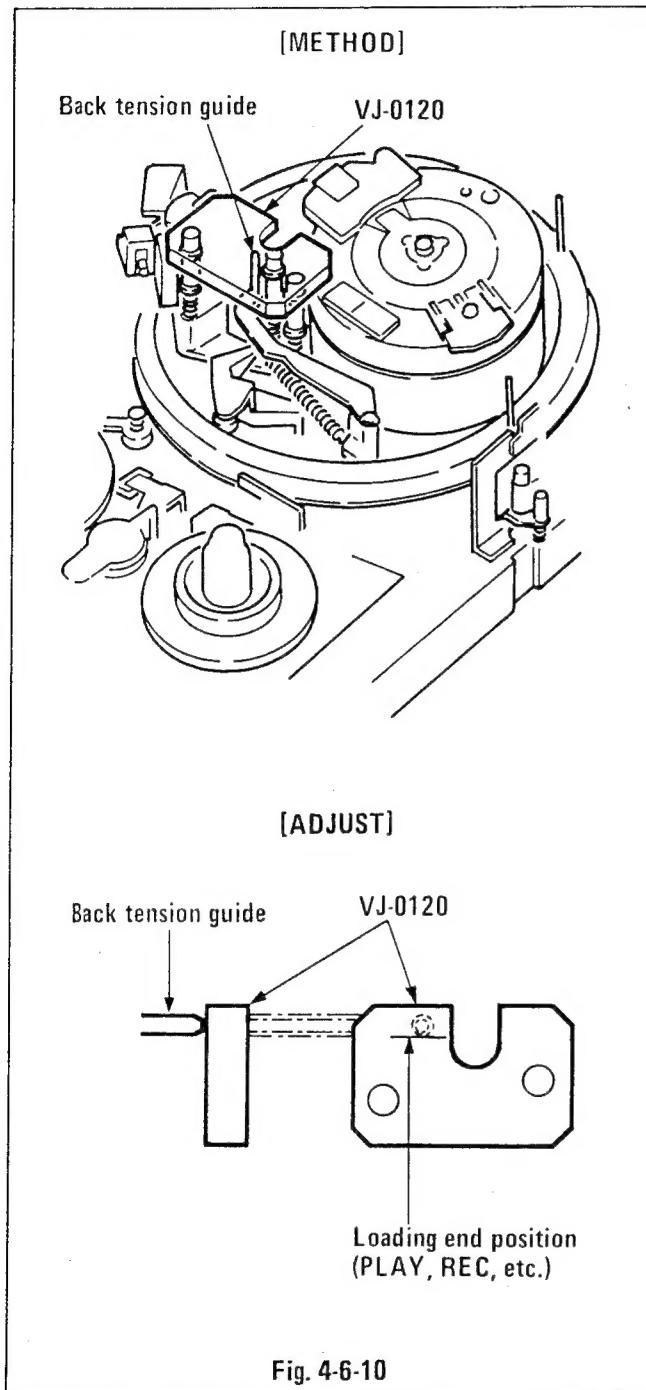


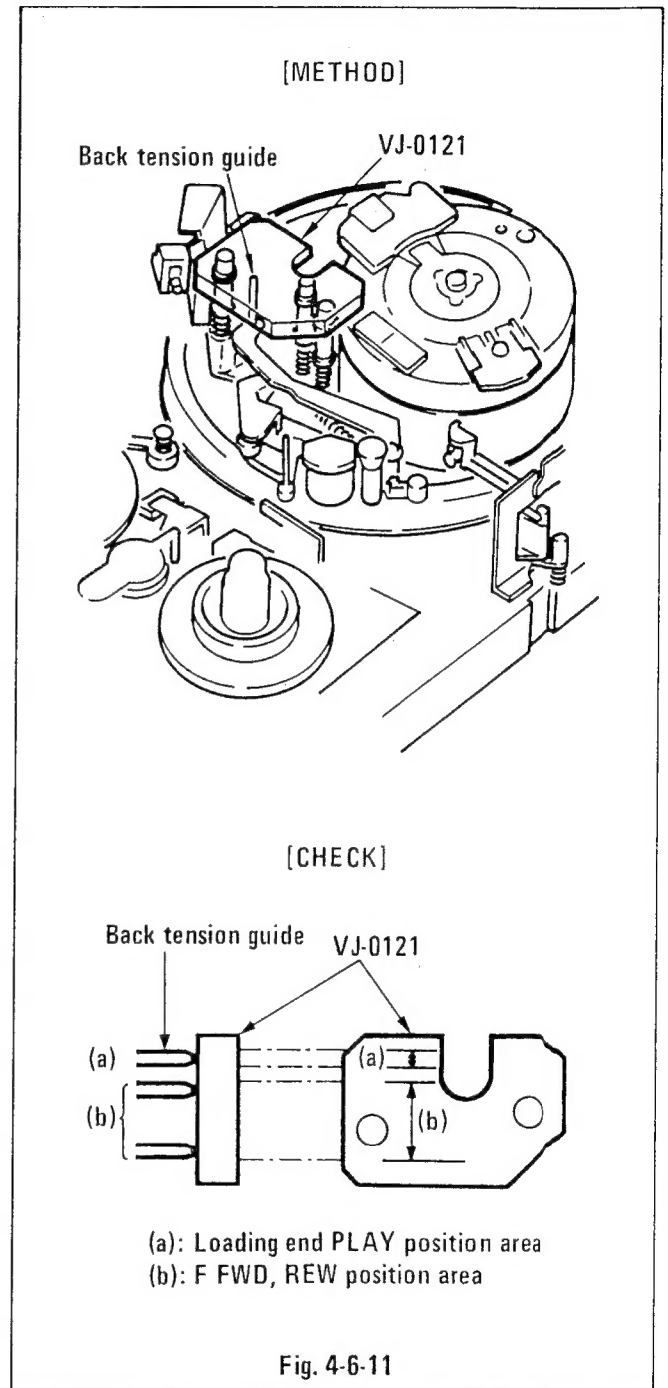
Fig. 4-6-9

* USING METHOD OF MECHANISM JIG

[Adjustment gauge of back tension guide ... VJ-0120]



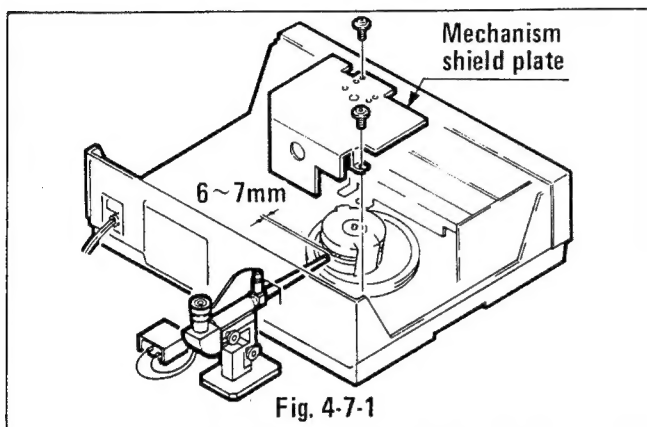
[Checker adjustment gauge of back tension guide ... VJ-0121]



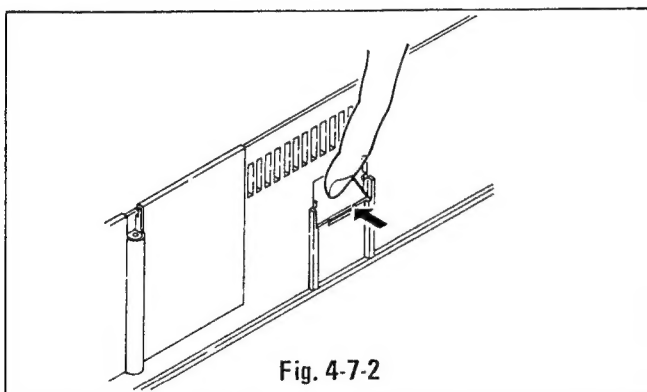
7. CONFIRMATION AND ADJUSTMENT OF THE LEVEL DIFFERENCE BETWEEN VIDEO HEADS A AND B

(Caution)

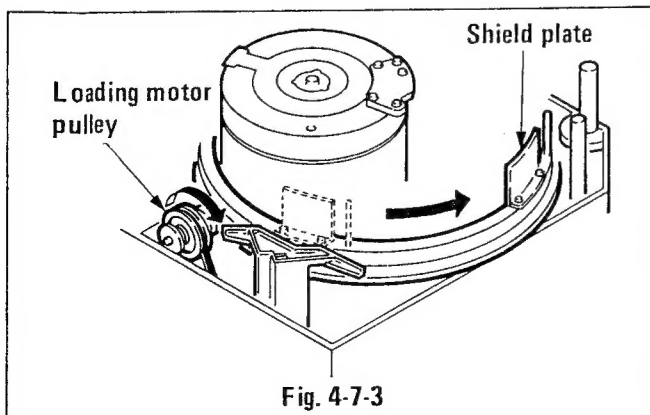
1. Be sure that the power switch is OFF.
 2. Place the microscope and the set on a stable level surface.
- (1) Remove the cabinet, the VD-1 circuit board and the mechanism shield plate. (See Fig. 4-7-1)



- (2) Remove the video head observation window on the rear of the unit by pushing it out from the inside of the cabinet.



- (3) Turn the loading motor pulley clockwise and change the position of shield plate attached to the loading mechanism.

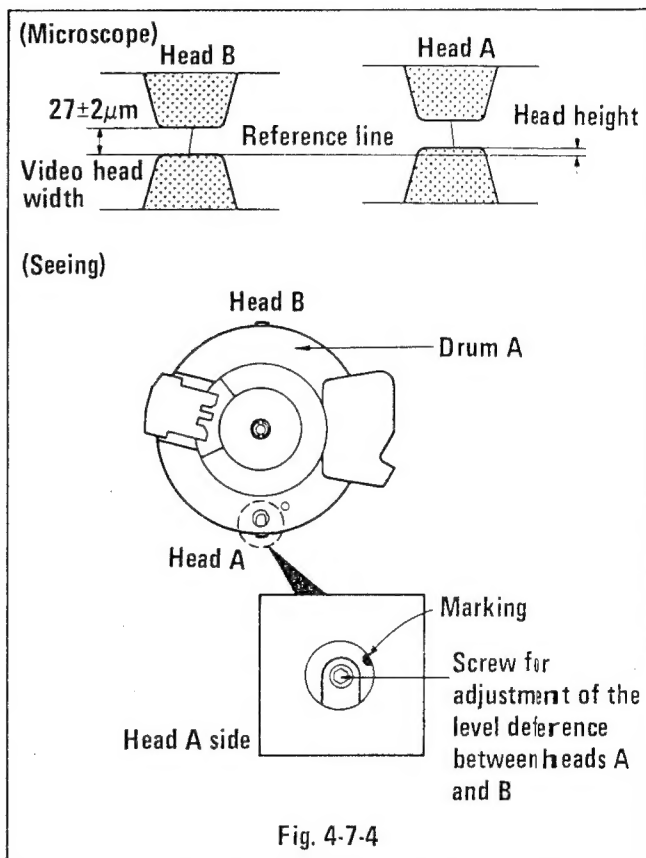


- (4) Insert the microscope (VJ-0063) as shown in the figure and focus it. (See Fig. 4-7-1)

(Caution)

Be particularly careful that the tip of the microscope does not come in contact with the video heads.

- (5) Using the microscope, confirm the levels of head A and head B. How to distinguish between heads A and B is shown in the figure. (See Fig. 4-7-4)



[Confirmation]

Using head B as a reference, confirm that head A is $0.0 \sim 2.5\mu\text{m}$ higher than head B.

[Head height adjustment]

Perform adjustment by turning the hexagonal wrench (JV-0108) the allen screw for level adjustment of head A only enough that you can tell it has moved, and adjust head A so that it is $0.0 \sim 2.5\mu\text{m}$ above head B. The allen screw for head B is used as a reference so do not move it. (See Figs. 4-7-4, 4-7-5)

* The level difference between heads A and B was correctly adjusted at the factory before shipment and locked in place. Therefore, adjustment is normally not necessary so do not move the heads.

Head condition using microscope: at 100x power, each mark equals 5 μ m.

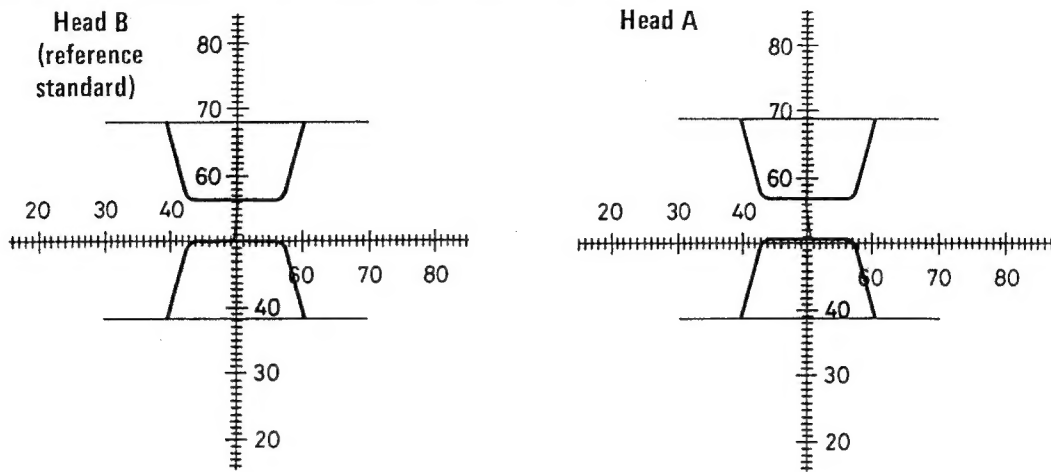


Fig. 4-7-5